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THE INTERNATIONAL SUGAR·JOURNAL

A·TECHNICAL·&·COMMERCIAL PERIODICAL·DEVOTED·ENTIRELY TO·THE·SUGAR·INDUSTRY

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cane carrier and intermediate carrier

SLATS

Mirrlees Slats combine strength with minimum weight.

CANE CARRIER SLATS

Can be supplied, double or triple corrugated, black or galvanised, and will suit any 6 in. pitch chain and 8 in. pitch chains in the larger sizes. Where dimensions are given, slats can be supplied holed for bolts or rivets.

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The photograph illustrates a 30 inch wide Conveyor 30 feet long and a drive gear assembly.

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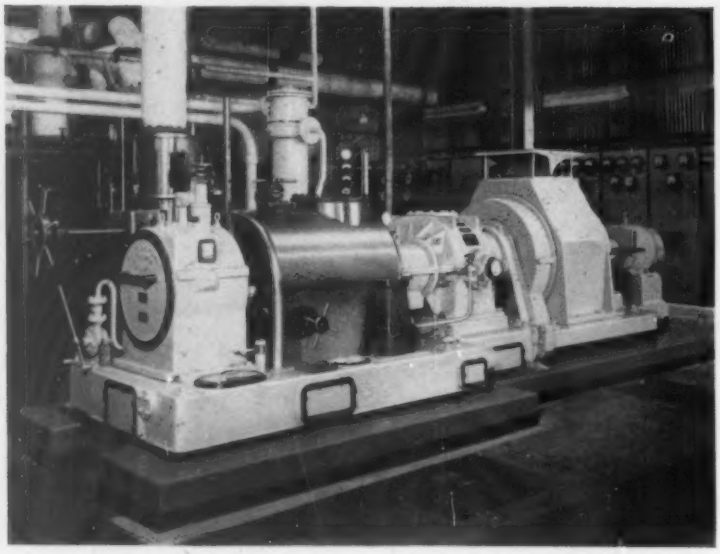

750 kw Back Pressure Turbine installed at the Farleigh Sugar Mill, Queensland, Australia.

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STEAM TURBINES AND STEAM ENGINES HAVE BEEN SUPPLIED FOR:—

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VACUUM PUMPS

for low pressure evaporation.

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Belliss & Morcom Ltd

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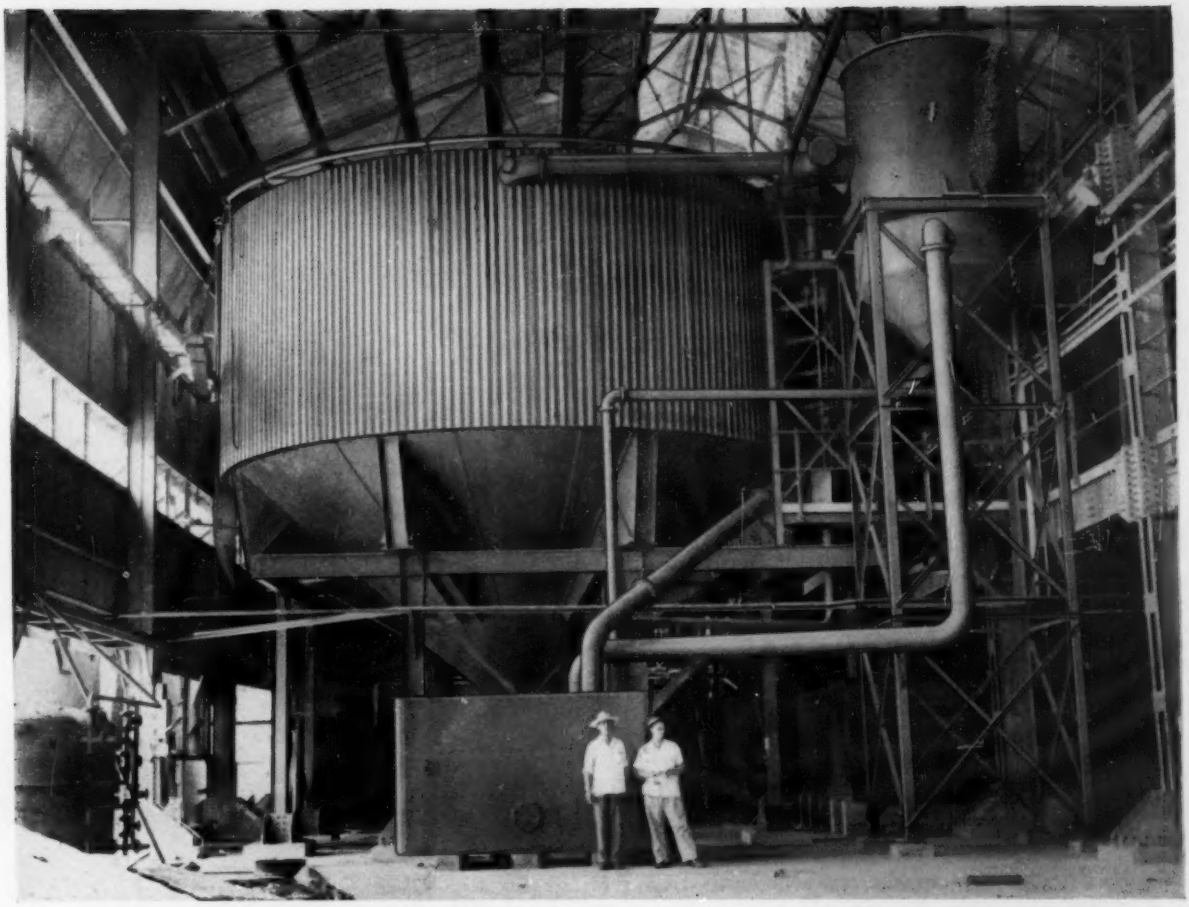

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Illustrated is one of our most recent installations, a 30 feet, 5 tray Subsider in operation in Venezuela.

This Subsider enables juice to be drawn off at 5 points of optimum clarity. Surface evaporation is obviated, no surface scum enters the tank, and a high temperature is maintained throughout the apparatus.

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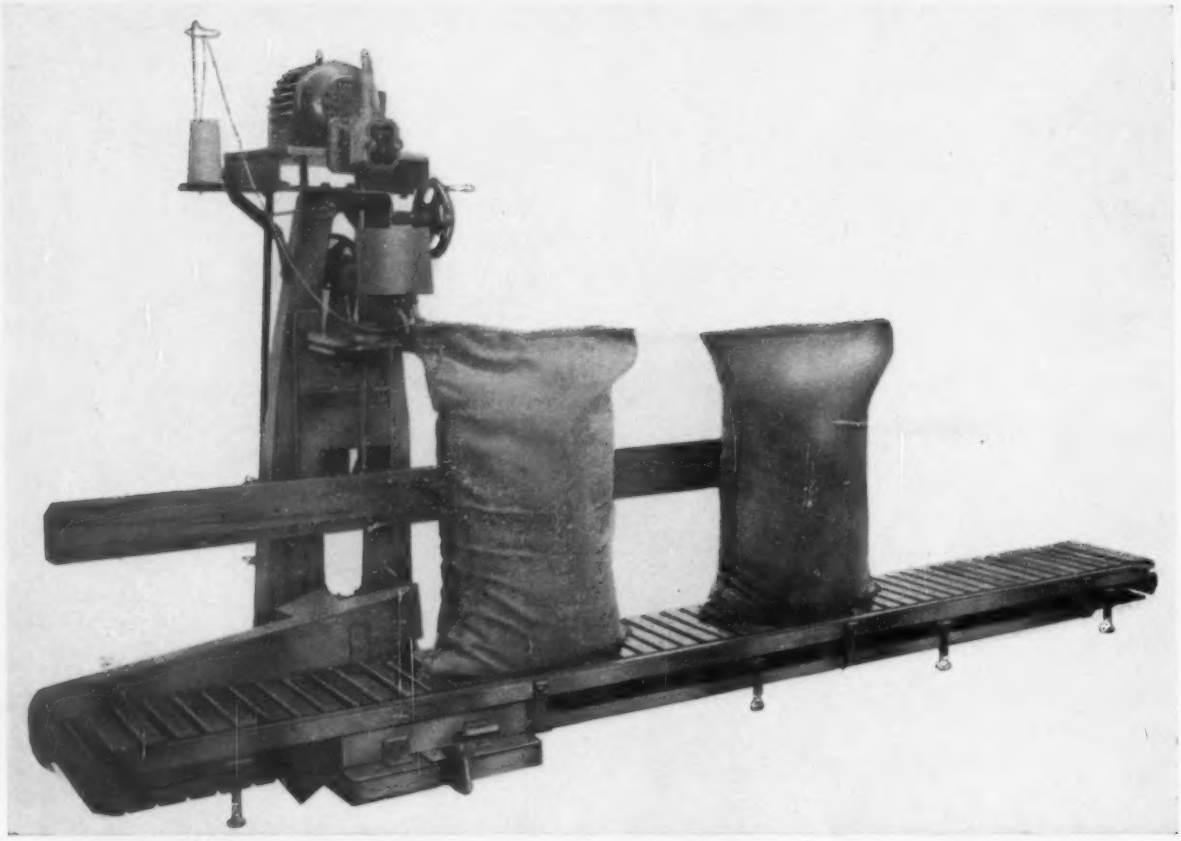
The 'Super' Universal Sack Closing Machine

MODEL NO. 5B

Fitted with 10 or 12 ft. Conveyor and Special Clutch Drive



This machine is fitted with a conveyor 10 or 12 ft. overall and a Special Clutch Drive which allows the conveyor to be run independently of the sewing head.

Jute, Hessian, Paper Lined Hessian, Cotton and Paper Sacks weighing from 50 to 325 lbs. can be sewn on this machine.

Machines can be seen working by appointment.

Power required 2 h.p. *Shipping weight : 14 cwts.*

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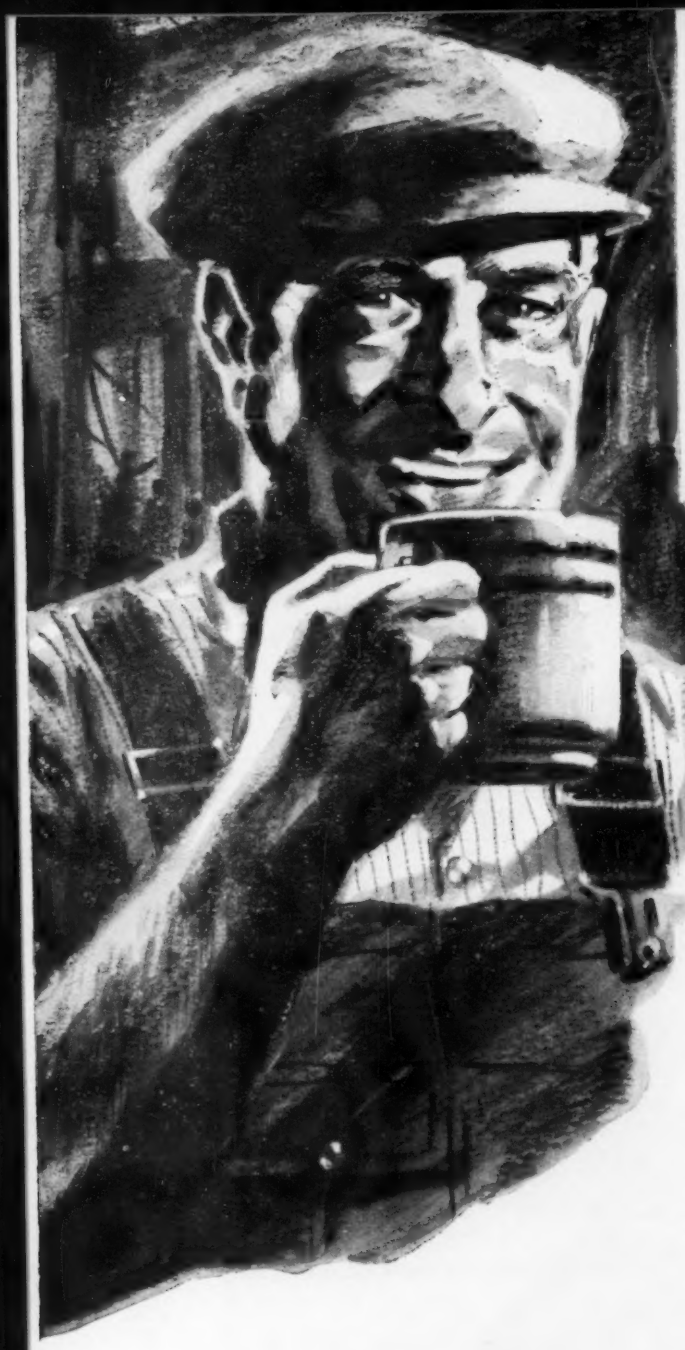
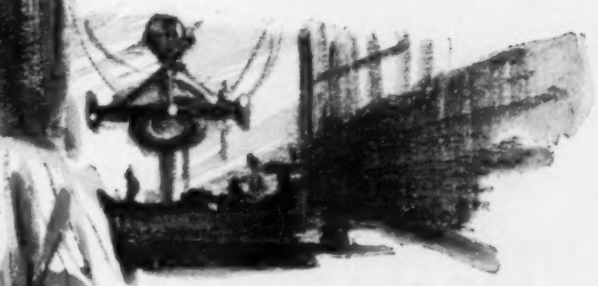


Helping to sweeten it is our cup of tea



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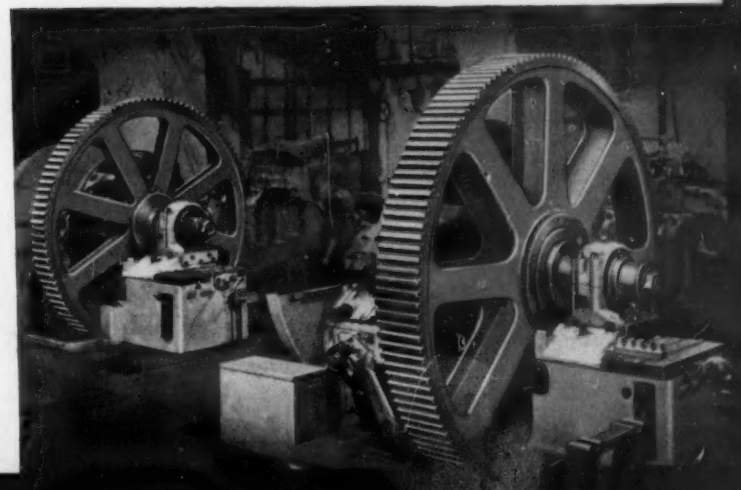

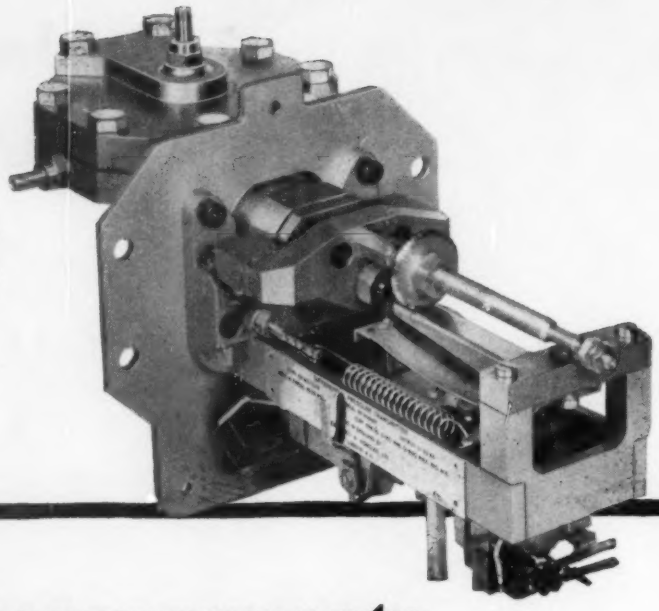

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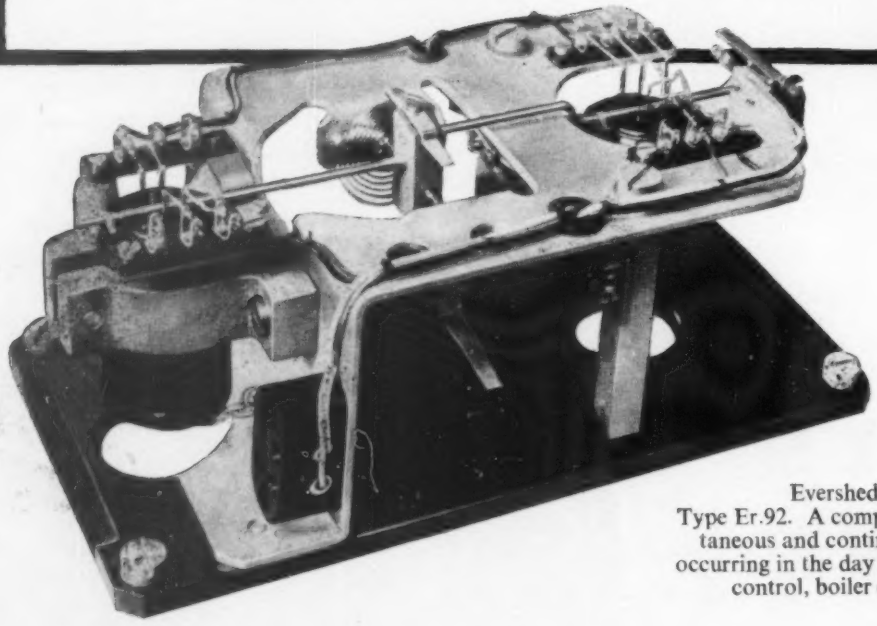

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7/136

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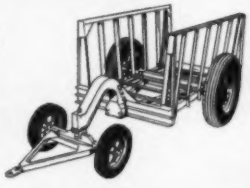
A quicker and better job at far less cost!

★ *They're not expensive*

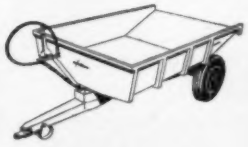
★ *They're built for the job, and when it comes to rugged strength*

you can't beat the Markham specification!

Markham's 5-Ton Heavy Pattern Sugar Cane Cart operates over the roughest terrain carrying large loads and is ideal for long journeys between plantation and factory. Large diam. rear wheels enable this cart to traverse uneven ground with ease. The swivel and pivot mounting of front axle ensure great stability making this Cane Cart extremely manoeuvrable.



For constructional jobs, road making, etc., this 3-ton hydraulic tipping 'Dumper' trailer is a winner; very strongly made, it will give years of service under the most arduous conditions.



For speedy, economical handling of cane, Markham's Cane Trailers are unsurpassed. They will work easily over rugged terrain, and their exceptional strength of construction ensures a long, trouble-free life.

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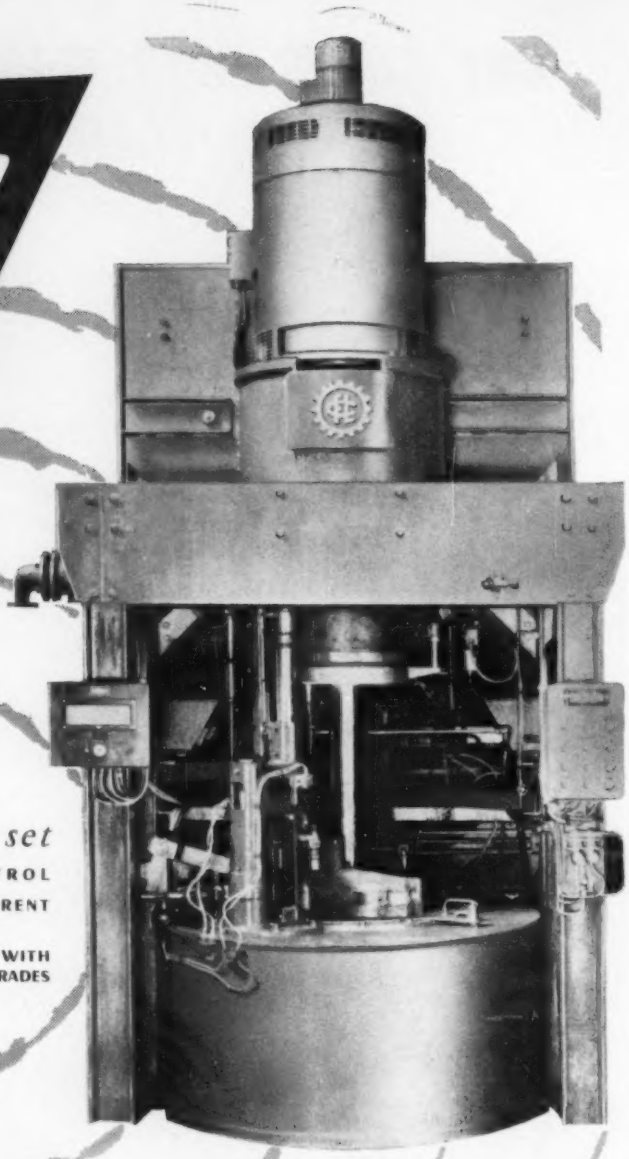

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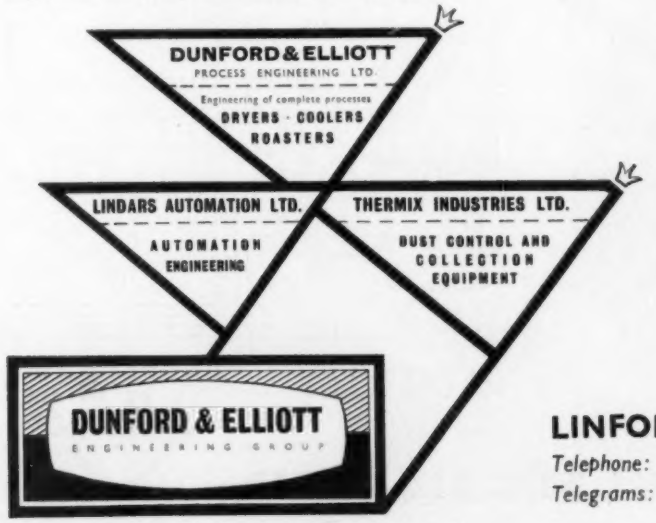

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Automatic regulation of feed ensures that cane knives are always working at peak efficiency thus achieving maximum throughput

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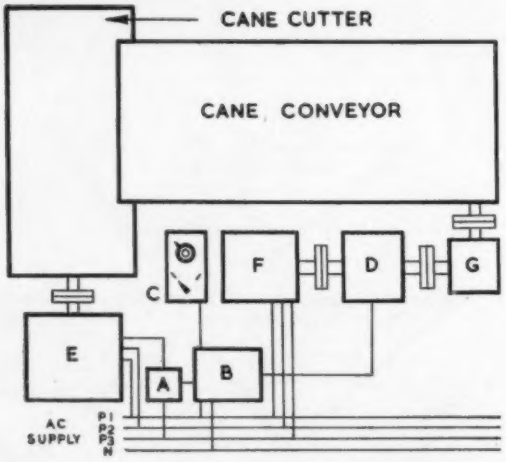
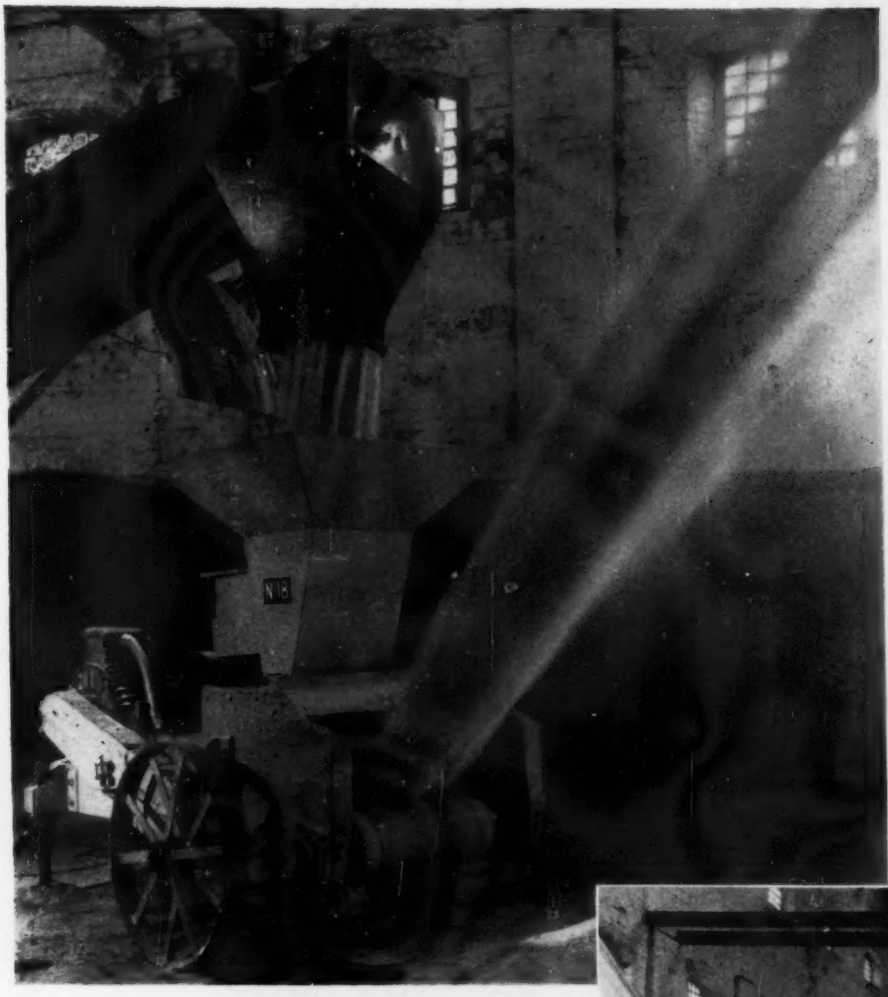


KEY TO DIAGRAM

- **A** Current transformer
- **B** Electronic excitation unit
- **C** Manual control of conveyor speed
- **D** HEENAN-DYNAMATIC COUPLING in conveyor drive
- **E** Cutter motor
- **F** Conveyor motor
- **G** Gearbox

HEENAN & FROUDE LTD., ENGINEERS, WORCESTER, ENGLAND



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Mobile high-speed throwers of the kind illustrated are ideal for piling many bulk materials. This machine can throw 220 tons per hour of raw sugar to a height of 50 feet over a distance of 90 feet. Similar throwers have been designed to handle up to 500 tons per hour.

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SALZGITTER
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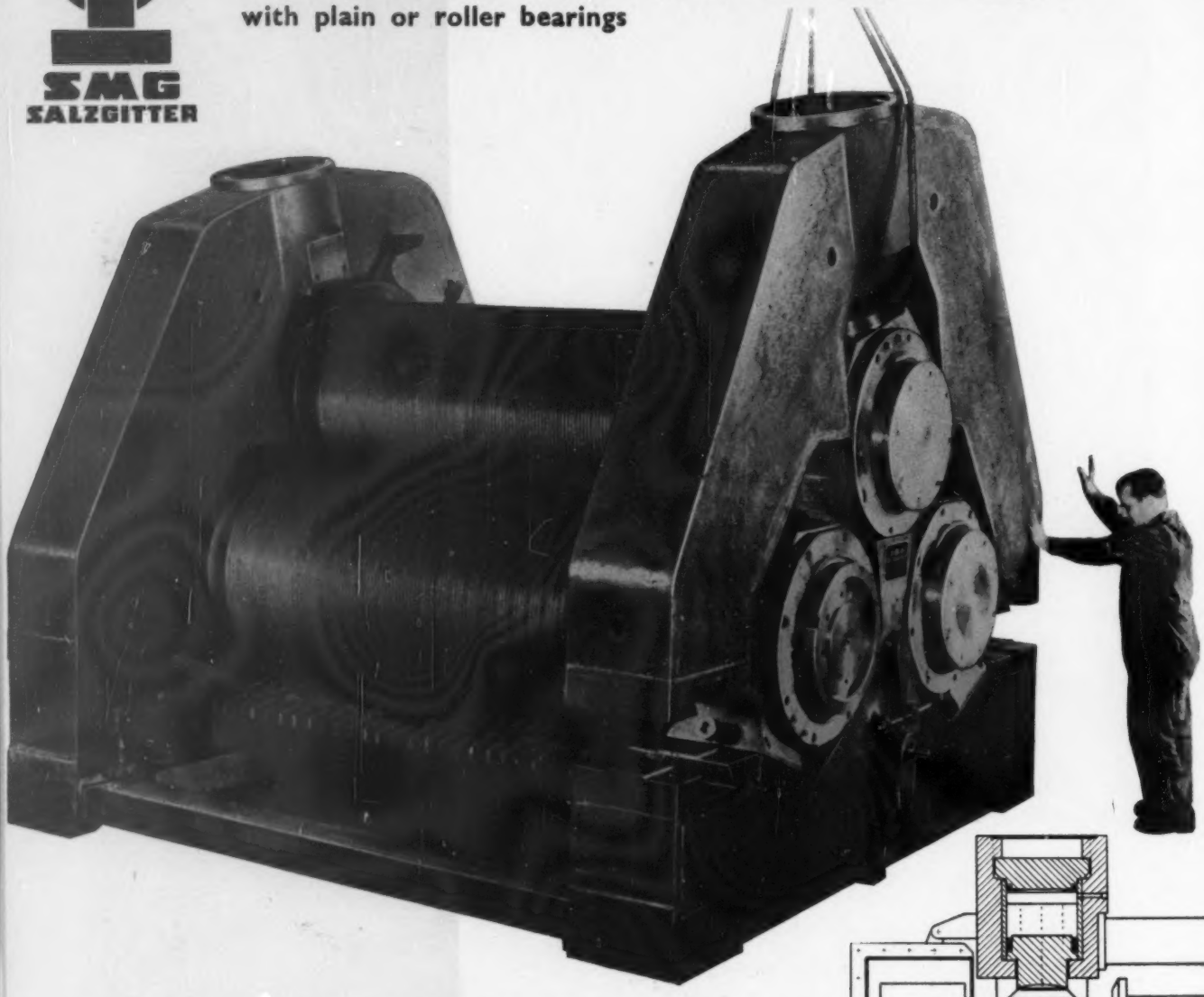
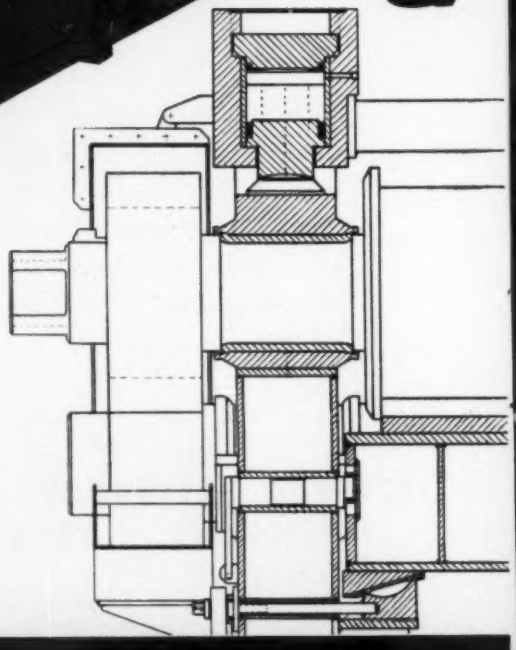
with plain or roller bearings





- **The two part mill headstocks can be quickly connected and disconnected by means of a keyed joint.**
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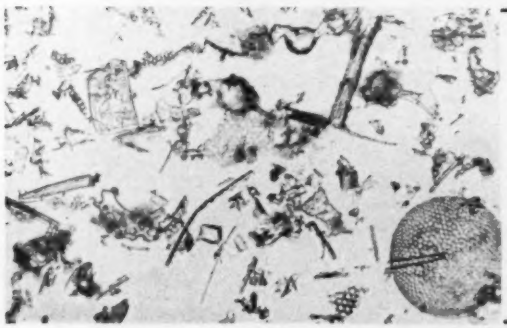
What have these "warriors' shields" got to do with better product performance?

Among the hundreds of different types of particles found in Celite diatomaceous earth are these "warriors' shields." Shown here magnified hundreds of times, are, from left to right, *Navicula splendida, Raphoneis amphiceros* and *Navicula lyra.*

They're particles of CELITE

that produce a porous, free-filtering cake, giving longer filtration cycles and brilliantly clear syrups.



Celite's unique diatomite structure is shown in this photomicrograph. The infinite variety of particle shapes and sizes gives Celite its exceptional performance characteristics as a filter-aid in the Cane and Beet Sugar Industries.

JOHNS-MANVILLE JM PRODUCTS

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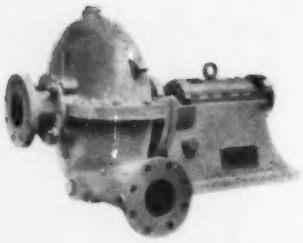
Your complete sugar factory from one and the same manufacturer:

a



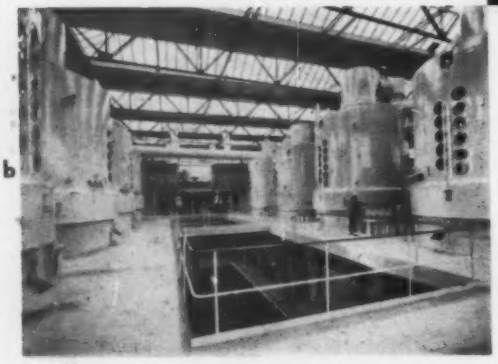
Baudouin

STORK HENGELO

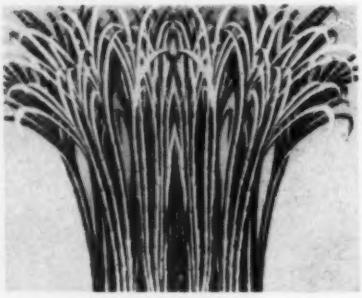
V·M·F

WERKSPOOR AMSTERDAM

b



The advantages are obvious. Harmony of construction and unity of design result in a well balanced manufacturing process and ensure efficiency, reliability and economy.



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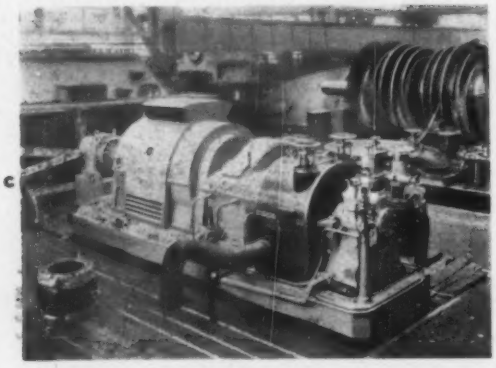
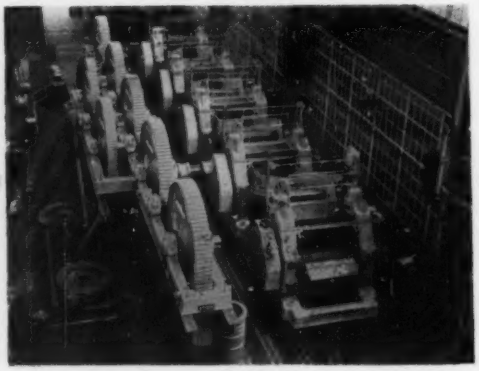


Illustrations show:

a. Stork-Werkspoor unchokeable pump.
b. Stork-Werkspoor battery of vacuum pans.
c. Stork-Werkspoor turbine-generator set.
d. Stork-Werkspoor milling plant.

d



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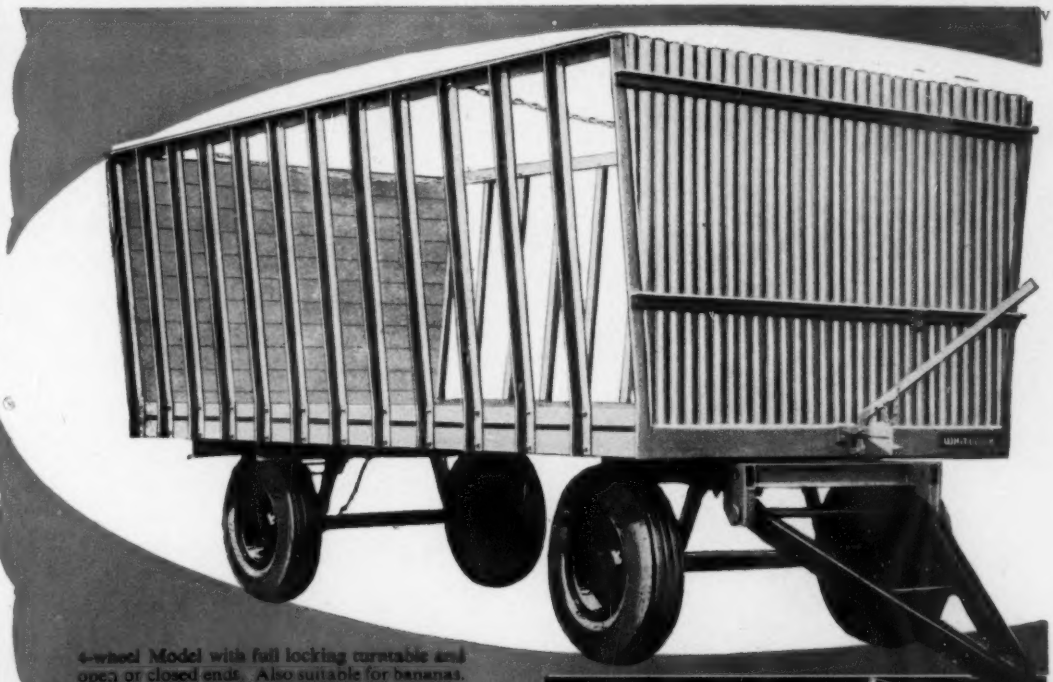
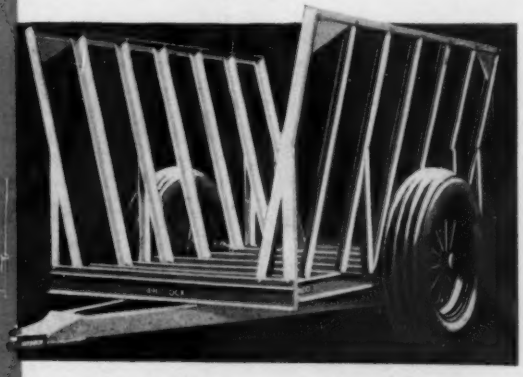


4-wheel Model with full locking turntable and open or closed ends. Also suitable for bananas. In various carrying capacities.

Cut cartage costs with

WHITLOCK CANE & FRUIT TRAILERS

4-wheel Goose-Neck type of pressed steel construction with extra heavy bracing for loads up to 6 tons.



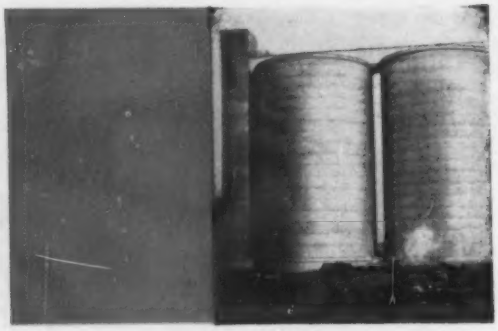
A low cost model on large diameter wheels for loads up to 5 tons.

Our factory representatives are at the moment travelling the cane growing areas and may be visiting you personally.

Whitlock Cane Trailers are backed by many years experience and will stand-up to the job.

Ask for catalogue SC.41 and send details of your requirements.

WHITLOCK BROS LTD. GREAT YELDHAM ESSEX ENGLAND *Tel: Great Yeldham 305 (8 lines)*



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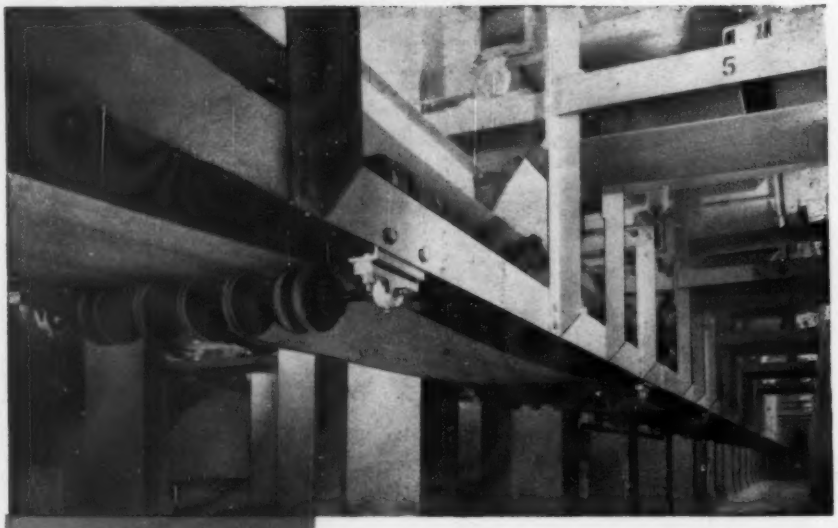

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FOR THE
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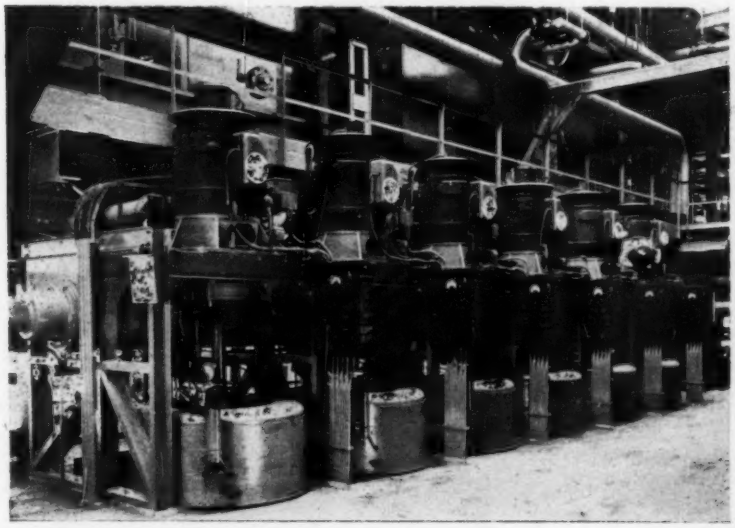

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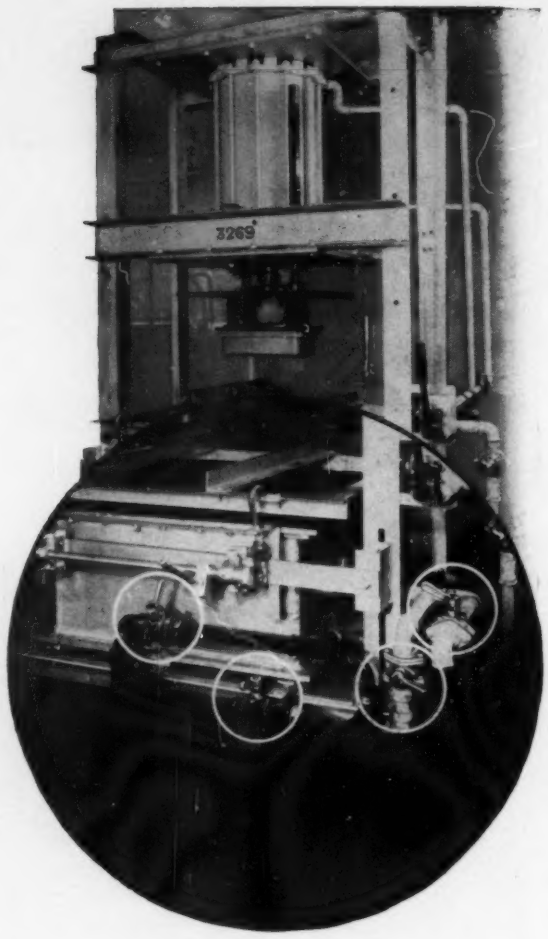

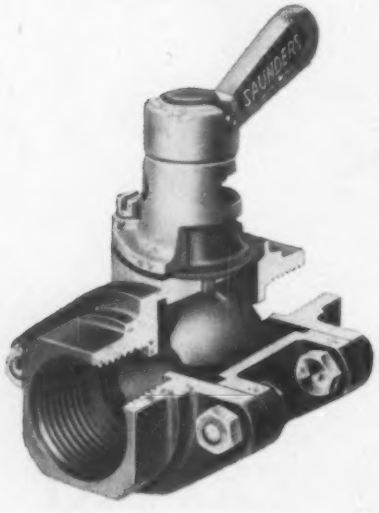

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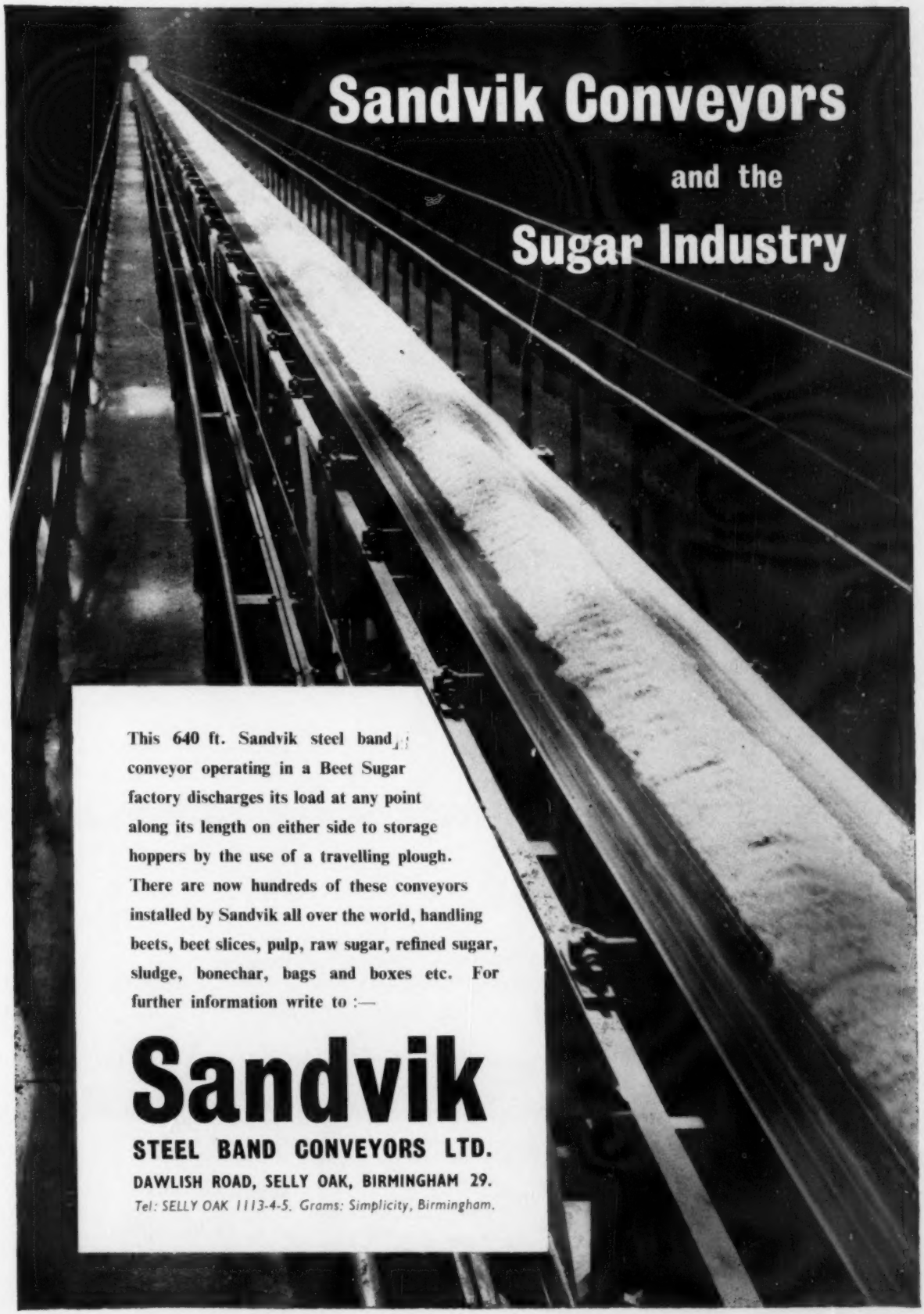

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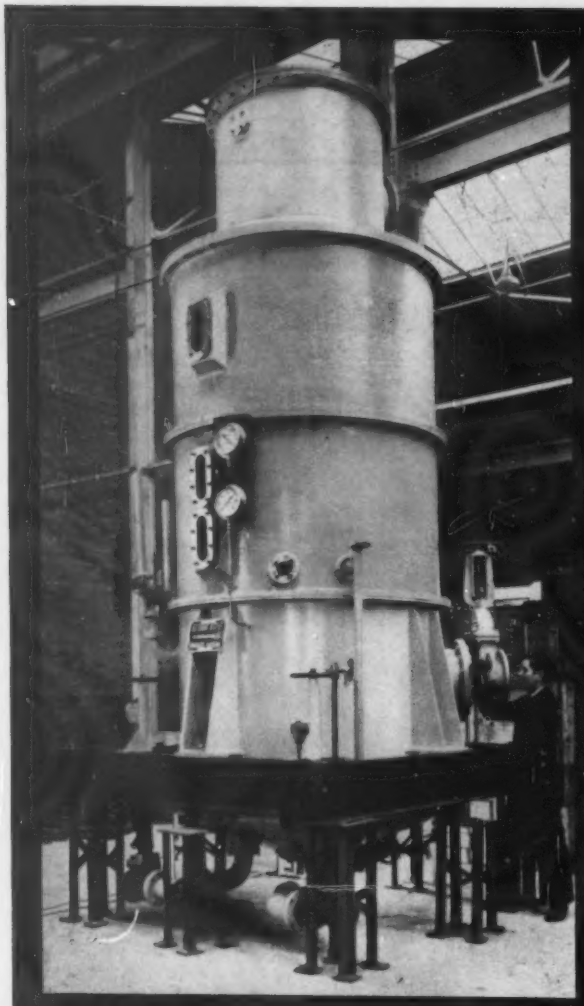

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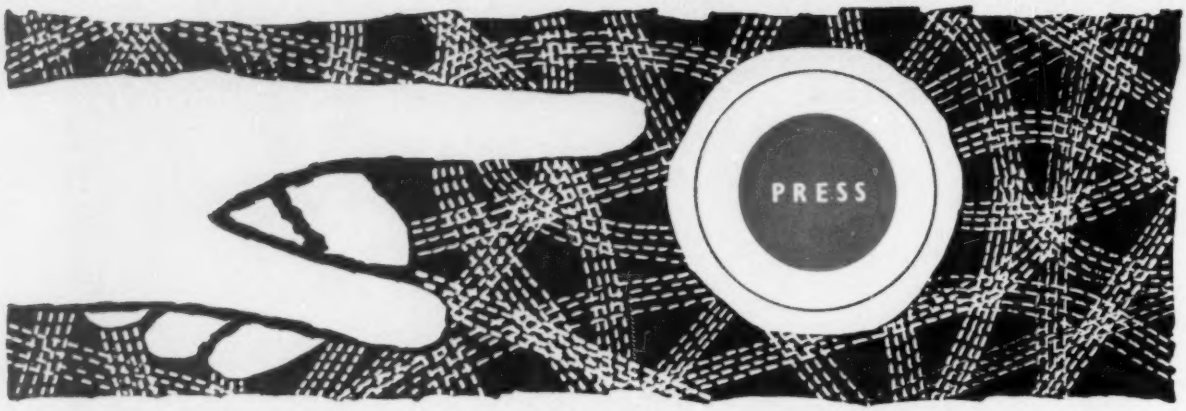

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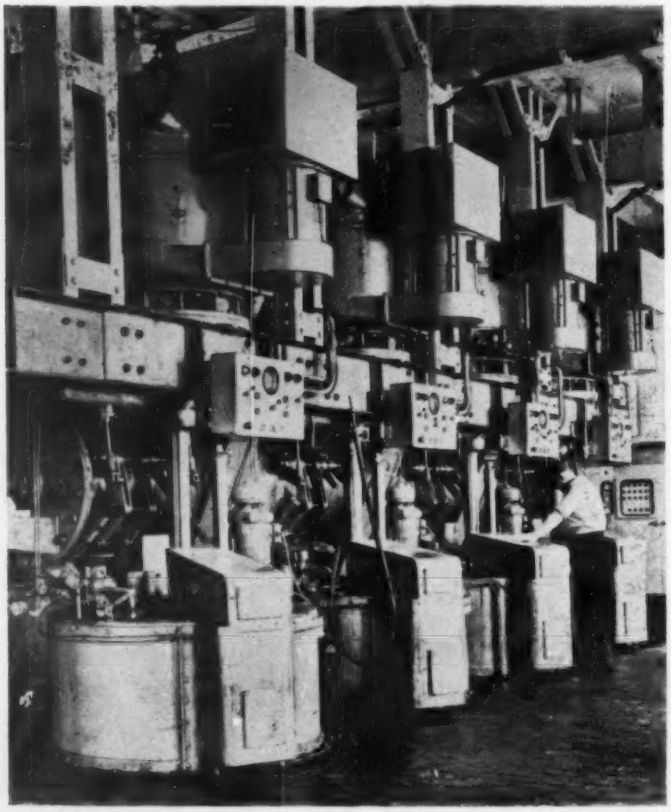

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THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXII MARCH, 1960 No. 735

NOTES AND COMMENTS

U.K. beet crop 1959/60[1].

The 1959/60 campaign in the United Kingdom has been completed with some 5·5 million tons of beet delivered to the factories as compared with 5,741,869 tons in the previous season. The estimate of sugar production is 760,000 tons, white value, which will create a new record surpassing the previous one established in the 1953/54 campaign of 729,542 tons. The outturn of beet per acre averaged 13·4 tons as against 13·88 tons in the 1958/59 crop.

* * *

Queensland's 1959 cane crushing season[2].

Crushing operations in Queensland for the 1959 season came to an end when the Babinda Mill concluded its crushing on 22nd December. The aggregate crushing was 8,428,803 tons of cane.

Sugar content was generally high and the estimated yield of sugar is 1,217,803 tons of 94 n.t. sugar.

With favourable climatic conditions for most of the season, and an effective milling capacity which operated smoothly throughout the campaign, the Queensland sugar industry has emerged from one of the shortest crushing seasons in its recent history.

The total of the mill peaks for the 31 Queensland sugar mills is 1,213,000 tons of 94 net titre sugar and a number of the mills reached them well before Christmas.

The season got away to a comparatively late start on 17th June when six of the northern mills began crushing. By the end of that month 14 mills were in operation, but 16 mills did not start until July and one, Rocky Point, waited till September.

There were some delays in cane deliveries to the mills, not only at the beginning of the season, as is customary, but later in the year as well. These delays were largely due to wet weather and a shortage of cane cutters which occurred towards the end of the season. Nevertheless, crushing rates at the mills were maintained at a high level.

It is significant that many of the mills reached their peaks in a very short harvesting period. For instance, one mill achieved its peak production in a crushing period of 15 weeks and two other mills ran for only 17 weeks to produce their peak tonnages.

With the mills thus starting later and finishing earlier than usual, in a season of favourable cane growing conditions, it was natural that c.c.s. results should have been exceptional, for the cane was in its prime for maturity rating for most of the time in such a confined season.

The State ratio of tons cane per ton 94 n.t. sugar is estimated at 6·92, the lowest for 15 years and the first time the ratio was below 7 in all that time.

Equally impressive was the fact that the State's aggregate of 8,428,000 tons of cane harvested in the season, which was sufficient to produce 1,217,803 tons of 94 n.t. sugar—slightly in excess of total peaks—seems to have been obtained from only about 299,000 acres harvested.

As a result, two further spectacular achievements appear in the statistical picture for the season:—the State average tonnage of cane harvested per acre exceeded 28 tons for the first time and the State average yield of 94 n.t. sugar per acre harvested exceeded 4 tons for the first time.

It was regrettable that market limitations imposed a brake upon such an abundant season and that the world market price dipped on one period during the year to 2·55 cents a lb, the lowest value registered since the early 1940's. In these respects, the year 1959 can be regarded as a most disappointing one.

Meanwhile, Australian internal costs of production continued to go higher. The persistent upward trend of wages naturally affects the whole economic structure and sugar is one industry which is gripped with special violence in this disturbing spiral.

The industry has endeavoured to match this trend with a constant quest for more and more efficiency. How much longer such an unequal race can keep up is a vital point in question.

[1] C. Czarnikow Ltd., *Sugar Review*, 1960, (443), 34.
[2] *Australian Sugar J.*, 1960, **51**, 779, 781.

International Sugar Council.

The prevailing price of sugar, as defined in Article 20 of the 1958 International Sugar Agreement, was below 3·15 cents for 17 consecutive market days from the 26th January.

The 5th Session of the International Sugar Council, called for under Article 21 (1) (v), was held at the seat of the Council on 2nd February 1960. H. E. The Hon. LEON MA. GUERRERO (Philippines) presided.

The Council, after considering all factors affecting the supply and demand on the Free Market, decided to apply a 2½% cut in the provisional initial export quotas established at its previous Session. The quotas in effect, therefore, are at a level of 85% of basic export tonnages. (In accordance with Article 23, this decision does not affect the quotas of countries with basic export tonnages of less than 50,000 tons).

The Council's revised estimate of likely requirements of and supplies available to the Free Market was: import requirements, 5,850,000 tons, and supplies, on the basis of a quota level of 87½%, 6,225,000 tons. This indicated an apparent excess of supplies over requirements of 375,000 tons. The effect of the Council's decision is so to adjust quotas as to maintain a somewhat closer statistical balance between supply and demand than that which was established by the Council at its 4th Session in November 1959.

The next regular Session of the Council, in accordance with Article 18 of the Agreement, will be held in London on 30th March, to make a final determination of initial export quotas for 1960.

* * *

Mauritius cyclone damage.

Fifteen thousand people are now known to be homeless in Mauritius following the severe cyclone that struck the west coast last month.

For 36 hours on 18th and 19th January, gusts of up to 100 miles per hour swept the island, wreaking havoc with power supplies and communications, destroying 6,000 homes and damaging as many again, scattering the fishing fleets and flattening tobacco, sugar and other standing crops. Damage to the sugar crop, by far the most important element in the island's economy, cannot yet be reliably estimated but first reports suggest that up to 40% of the crop has been destroyed.

* * *

Russian purchase of Cuban sugar.

Just before the close of trading in New York on Friday 5th February, it was announced that Russia had purchased from the Cuban Institute 345,000 tons of raws for February/May shipment at 2·78 cents. C. Czarnikow Ltd. commented[1]: "That Russia had further requirements to cover had been anticipated by many and it was hardly surprising that news of the transaction should have been released to coincide with the visit of the Russian First Deputy Prime Minister to Cuba. Nevertheless, the magnitude of the tonnage concerned had been quite unforeseen and in a spate of nervous short covering terminal values improved by around ten points. This advance was short-lived, however, for a rumour that Cuba would increase her decreed crop by 300,000 tons to compensate for this outlet brought a wave of selling pressure and a subsequent official denial came too late to affect the exchange, where prices had closed no more than one or two points up on the day.

"It is interesting to consider the statistical positions of both Cuba and Russia in the light of this transaction.

"International quotas are at present at 85% of basic tonnages and under the terms of the Agreement no increases are provided for until the 3·25 cents level is passed. Nevertheless, quotas are still only provisional and should values recover to around 3·15 cents some upward revision may well be considered by the Council when it meets at the end of March. At current prices, however, the only additions Cuba may look for are in the form of redistributions resulting from other countries' shortfalls. These, we anticipate, will amount eventually to about 375,000 tons, which will bring the total she is permitted to export during the year to 2,572,000 tons. Sales to date for shipment to the World Market during 1960 are in the region of 1,250,000 tons, which by any standards must be considered a most satisfactory proportion at this early date. Actual physical exports amounted to about 200,000 tons during January.

"The most startling aspect of Russian statistics is the quite remarkable increase in consumption which has taken place in recent years. Official reports have put the 1959/60 crop at about six million tons, white value, whilst purchases of Cubas since August amount to 845,000 tons, or 780,000 tons, white value. On the other hand Russia has certain export commitments which, if the pattern of recent years is to be followed will amount to about 175,000 tons, white value. Details of stock holdings and imports from Czechoslovakia, Hungary and Poland are not available but excluding such quantities from our calculations it appears that annual consumption in Russia, on the basis of a population of 212 million, is now in the region of 70 lb per head."

As we go to press it is reported that Mr. MIKOYAN and Dr. FIDEL CASTRO have signed an agreement under which Russia will buy 425,000 tons more Cuban sugar in 1960 and 1 million tons a year for the next four years. Russia will give Cuba a $100 million credit for machinery at 2½% interest. Russian technical assistance is to be provided if requested by Cuba.

[1] *Sugar Review*, 1960, (403), 33.

QUALITY AND QUANTITY

THERE is always a risk of misunderstanding when words in common usage become incorporated into technical language, thereby receiving a technical status without a technical definition; such a word is "quality". Occasionally an approach to a definition is possible as in the case of sugar cane and beet, in which quality is measured by the % sucrose in the juice—a quantitative measure. That, however, is not the case with the cane plant, sucrose % juice being only one of the many factors that enter into its quality. Still less capable of definition is quality in the case of such products as cotton, fruit and tea—judgment in the latter case is, or used to be, the trained palate of the tea-taster and raised the intriguing problem of whether his order of preference varied with the events of the night before. In some cases, too, attempts have been made to find a quantitative evaluation of quality as in the case of barley when, if memory serves, an "iodine index" was evolved, but never generally accepted, to measure malting quality.

But, it will be noted, in all these cases the use of the word "quality" bears reference to that part of the plant which is of economic importance to man—and to that part only. The word, to be accepted in a technical sense, should have an application to each and every tissue and function of the plant as well as to the plant as a whole. Here "quality" becomes synonymous with health and has actually been used in that sense[1]; and health depends on the correct functioning of a long chain of enzymic reactions culminating in the formation of the compounds specific to the species and, ultimately of protein and DNA (deoxyribonucleic acid), a phosphate combined with the sugar deoxyribose. Any break or disorganization in this enzymic chain leading, for instance, to the formation of an amino-acid alien to the particular species, is likely to lead to loss of quality or, in other words, ill-health.

The enormous strides made in recent years in organic chemistry and in technique, particularly in the use of "tagged" elements and chromatography, have vastly increased the knowledge of the vital processes,[2] but there is a long road to travel before the whole story can be told. One fact, however, is now adequately demonstrated: that of the intimate rôle played by the trace elements in the correct functioning of these intricate processes—to quote one instance only, vitamin B 12, a cobalt-containing substance, has been isolated from the liver of man and any deficiency leads to failure to manufacture red blood cells with its consequence, pernicious anaemia. That cobalt injected into the blood is ineffective as a cure but effective if taken through the mouth, appears to indicate that it is the micro-organisms of the intestinal tract that activate the cobalt. This capacity of micro-organisms to advance the "quality" (or health) of the higher organisms receives confirmation from the fact that *Streptomyces griseus*, the source of streptomycin, also synthesizes vitamin B 12. Combine that fact with the fact that the animal, including man, is unable to synthesize certain amino-acids and must obtain them ready-made from the vegetable portion of their diet, and it becomes clear that quality in the higher organisms is but the apex of the correct adjustment of the links in a continuous chain of which micro-organisms form the lowest link. The evidence has been assembled by VOISIN[1] and is mainly drawn from a study of animal health, but it can hardly be doubted that there is here a general principle equally applicable to plants. There remain vast gaps in the evidence, as VOISIN modestly indicates when he represents present knowledge by a disc $\frac{1}{16}$ inch in diameter and present ignorance by one with a diameter of $1\frac{1}{2}$ in.

It is a curious fact that little has yet been done to link up this new foundation of knowledge with agricultural practice. The intimate rôle of the trace elements has been noted above, yet how much labour has been, and still is being, put into fertilizer experiments limited to the three elements N, P and K, and to their design to satisfy the latest statistical requirements, with their sole measure a quantitative one—yield? On the commercial side, the evidence is even more striking; fertilizers on the basis of proportional differences of N, P and K are still sold according to the crop and not the soil. Willingness to make soil analyses is sometimes included but this omits any reference to the large seasonal variations which occur in the available amounts of these three elements.[3] It is true that fertilizers compounded of the three elements have given vast increases of yield, for they, particularly N, are most closely associated with the photo-synthetic processes which form the carbohydrates contributing so largely to yield; but that very quantitative effect masks the fact that they also play as vital a part as trace elements in the qualitative processes—N is an integral element in proteins and P in DNA—yet, applied in excessive amounts, as in the case of pasture, N can reduce the copper in the grazing animal with consequent rickets and osteomalacia. It is not their use that is under criticism but the limitation in practice, with the rarest exceptions, e.g. Cu in the Florida Everglades, to these three elements. The point is well put by VOISIN:—

> What must be stressed is that mineral fertilizers have not only increased the yields of agricultural crops: if correctly used, they can clearly improve the quality. But, it must likewise be remembered that the same fertilizers incorrectly applied *reduce* the quality of the produce.

A new aspect introduced here is that of "balance", a word that, like "quality", is creeping into technical literature. In a recent lecture, a leading soil scientist referred to the problem of fertilization as one of

[1] A. VOISIN: Soil, Grass and Cancer. (Crosby Lockwood.)
[2] J. A. V. BUTLER: Inside the Living Cell. (Allen and Unwin, London.)
[3] *I.S.J.*, 1959, **61**, 324.

correct balance. But what is the measure of "balance"? No little study has been devoted to such subjects as base exchange, phosphate fixation, mineral antagonism as between molybdenum and copper and so on; but, in the soil, with the added complexity of organic matter both living and dead, the problem assumes the proportions of the distortions induced in a spider's web by the entanglement of a fly. Nature delivers the answer naturally and immediately, but it is beyond human capacity to calculate the varying strains on each thread. Under the circumstances, soil analysis has little to offer, even if the trace elements were included, as they seldom are; nor have fertilizer experiments, which concern themselves only with quantity. The conclusion to be drawn is that the plant alone can give the answer as is gradually becoming recognized with the adoption of what, for brevity, may be termed foliar diagnosis—a diagnostic method in the development of which the sugar industry has taken a leading part.

There remains, however, one fundamental question: how does the mineral element obtain entry to the plant before absorption into the organic complex? E. J. RUSSELL[4] has described both the older and the more recent views on this matter. The process, in both explanations, is a purely physical one: the adsorption of the ion on the root surface and its transfer into the plant by a system of pumping, the energy for which is derived from the oxidation of sugar by oxygen in the soil air. But nature rarely acts by such direct means; moreover, this explanation ignores a host of phenomena associated with the root. Not the least of these is the presence, in most crop plants, of a mycorrhiza associated with the root. This association is sometimes specific and it varies in degree: intimate in the case of endotrophic forms and with varying degrees of intimacy in the ectotrophic forms. Such complex specific associations can hardly be without significance and there is a wealth of evidence, assembled by A. HOWARD,[5] to show that the quality (health) of the host-plant is vastly improved thereby. Too little is as yet known about the detailed functioning of this association, but present knowledge has been summed up by S. D. GARRETT,[6] who defines the function of the ectotrophic forms as the supply of N and mineral salts by a more efficient means than by the root hairs in return for a supply of carbohydrates.

With this mycorrhizal relationship must be linked, it would appear, that other phenomenon of root secretion which so clearly stimulates bacterial and fungal activity in the rhizosphere. May it not be that the complex reactions associated with the root are Nature's way of short-circuiting her full cycle of alteration of inorganic and organic phases? If that be so, quality may be found to depend on an extension of the enzymic chain into the medium external to the plant which then derives some of the minerals essential to quality already incorporated in organic form whether by the mycorrhiza or even by direct reaction between the organic root secretion and the inorganic section of the soil complex. There is ample evidence that plants, such as obligate parasites, lose their capacity of obtaining the essential elements, not only the trace elements but also those involved in the photo-synthetic processes, as in the case of phanerogamic parasites such as *Cuscuta*. It would seem that indolence, that inherent character in man, is also inherent in plants which adopt the least troublesome means of securing their essential mineral requirements.

This conclusion is, admittedly and necessarily, highly speculative for, as VOISIN says, our knowledge is little and our ignorance great, but, as it appears to the writer, in its acceptance as a postulate, lies a line of study which might well break the present deadlock of ever-increasing quantity, following higher and ever higher fertilization, with ever-diminishing quality.

H.M.-L.

Postscript.

Since the above was written, there has come to hand an article by J. M. FIFE and I. E. STOKES, "Amino acid changes identify ratoon stunting disease".[7] Two samples of the first 3 leaves were submitted to a 2-dimensional chromatographic test and showed, in the first case, a sum of the amino acids, glutamic acid, serine, glycine, threonine and citrulline, in mg%, 52·7 in the healthy plants and 79·7 in the infected plants—an increase of 51·2%. The corresponding figures in the second sample, in this case the sum of aspartic acid, glutamic acid, serine and citrulline, were 32·5 and 51·6—an increase of 58·8%. The difference appears to be limited to the three upper leaves.

The objective of the study was to find a more assured method of identification of the disease; hot water or air treatment is accepted as the remedy. But is not the real question behind these results this: what are the underlying causes of this amino acid difference? If those causes can be traced, it may become possible to replace the curative process by prophylaxis. The bearing of this study on the thesis, developed by A. VOISIN reviewed above, is evident.

Experiments on the germination of sugar cane seed. S. LEE and Y. S. LOO. *Rpt. Taiwan Sugar Exp. Sta.*, 1958, (18), 1–13.—Germination capacity at different ages from fertilization was tested by removal of all unopened florets at time of fertilization. A low % of seed in the milk stage (15 days) germinated; germination then increased progressively to a maximum at 30–35 days when the seed was ripe. Ripe seed was stored (a) in wax-paper envelope in laboratory, (b) in desiccator over "Riken Adosole" and (c) as (b) but at —4°C to —5°C. Under (a) all viability was lost in 3—4 months, under (b) it decreased gradually to cease at 33 months, under (c) viability had fallen from 70% to 23% at 36 months.

[4] *The World of the Soil.* (Collins, London.)
[5] *Farming and Gardening for Health and Disease.* (Faber and Faber, London.)
[6] *Biology of Root-infecting Fungi.* (Cambridge University Press.)
[7] *Sugar y Azúcar*, 1959, **54**, (12), 27, 28.

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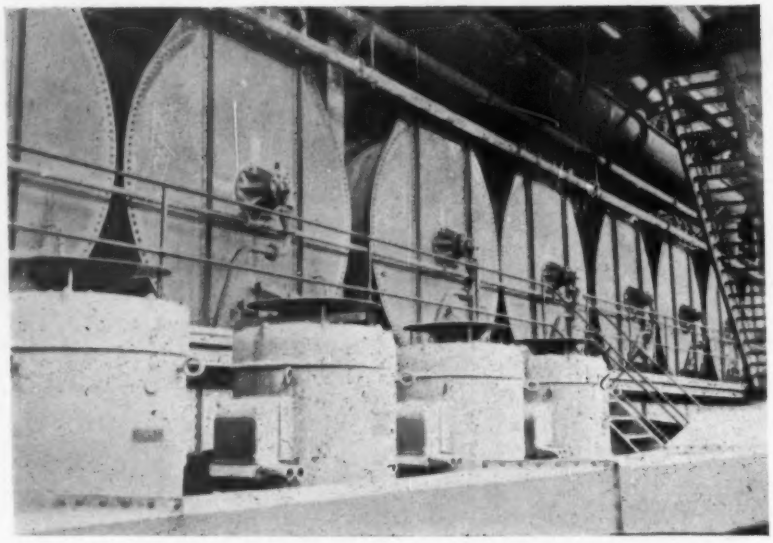

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SUGAR CANE AGRICULTURE IN SOUTH AFRICA

PROCEEDINGS OF THE THIRTY-SECOND ANNUAL CONGRESS OF THE SOUTH AFRICAN SUGAR TECHNOLOGISTS' ASSOCIATION, 1958.

THE larger number of the papers presented to the Congress are concerned with technical aspects within the factory. The relatively few agricultural papers are noted below.

The general practice throughout the industry is an interline distance of 4 ft 6 in, the selection of which appears mainly to be its convenience for mechanical inter-row spacing. More definite information, supplied by a series of experimental plantings, is given in a paper by C. H. O. PEARSON. It describes the results not only of spacing from 3 ft to 7 ft but of spacings within the line at intervals of nil to 7 ft between sett ends.

The results, as might be expected, are not capable of simple analysis. A major factor affecting the result is the moisture status of the soil. In years of low rainfall (about 50 in) a 3 ft spacing causes too big a water-strain followed by low relative yield of cane; but a uniform harvesting date gives non-comparable figures for sucrose, for the closely planted cane matures earlier. The same limitation would appear to apply to inter-sett interval within the row but, unfortunately for the experiment (not the industry), no really dry season intervened. This disadvantage is overcome where spray irrigation is possible. One practical conclusion is that there is no advantage in supplying gaps in a cane row unless over 3 ft in length, but it is a conclusion which does not apply where irrigation is possible. As the discussion showed, the conclusions are subject to modification to compensate for differences in such factors as fertility.

In a further paper, the same author compares three systems of cane cultivation:

(a) cultivate old stools by "Rotavator" in September and broadcast sunnhemp in October; plough-in in April and immediately plant cane for harvest at 21 months;

(b) as above but leave as bare fallow till September before planting cane, harvesting it at 20 months;

(c) cultivate by "Rotavator" as above and plant cane in the following month (October) with 75 lb sulphate of ammonia in the furrow, harvesting at 24 months.

A highly significant increased yield both in plant and ratoon crop was obtained under system (c). The experiment, it is noted, was conducted on heavy land in which decomposition of green manure was likely to be slower than on light land. The experiment has a bearing on the elusive problem of the value of organic matter. The author defines his objective as testing the possibility of building up organic matter by treating cane as a kind of permanent pasture. Unfortunately the exact method of the disposal of trash is not made clear.

The three remaining papers deal with subjects important in themselves but not directly concerned with cultural operations in the field. Cane in South Africa is subject to five major diseases, mosaic, streak, smut, red rot and gumming and in attempting to determine the resistance of any new variety to these diseases, a somewhat complex system of testing has been evolved and is described in some detail by G. M. THOMSON. In this a distinction is drawn between resistance and susceptibility on the one hand and tolerance on the other. Artificial infection is considered a short cut giving results inconsistent with those obtained by natural infection in the field and a somewhat intricate system of layout is portrayed ensuring, where necessary, the presence of vectors.

The plant nutrient derivation from soil minerals is the subject of a paper by R. R. MAUD and deals in particular with the disintegration of parent rock under the influence of the climate, topography and vegetation of Natal. After a general description of the stability of the general minerals to weathering, the derivation of the nutrient elements is noted under three heads: cations, anions and trace elements.

In the last paper J. LINTNER gives in considerable detail the results of ten fertilizer trials (five of which include varieties in addition) under random block and quasi-Latin Square design, of which he appears to be a strong advocate. The whole series shows marked interactions both between different nutrients and between variety and nutrient but the data are too complex to detail here and the paper is best described, in the words of the Chairman on the previous paper, as of great value for it would form a useful reference.

H.M.-L.

Disease in relation to variety plantings in 1959. E.V. ABBOTT. *Sugar Bull.*, 1959, **37**, 272, 273, 283.—Observations are recorded on mosaic, chlorotic streak and ratoon stunting disease in relation to varietal behaviour.

* * *

Results of sugar cane variety tests in Louisiana, 1958. T. J. STAFFORD *et al. Sugar Bull.*, 1959, **37**, 293–303.—A detailed and heavily tabulated record is given of the field trials carried out in 1958 by the Houma Field Station, U.S. Dept. of Agriculture.

* * *

Long term effects of "Heptachlor" and "Endrin" on borer population. W. H. LONG *et al. Sugar Bull.*, 1959, **37**, 323, 324.—In recent years, "Heptachlor" has been used to control fire-ant. Fields so treated in the spring of the previous year are shown to carry several times the number of borers occurring in corresponding fields not so treated or treated with "Endrin".

Date of flower bud formation of sugar cane. P. Y. JUANG. *Rpt. Taiwan Sugar Exp. Sta.*, 1958, (18), 14–23.—Notes are given on the formation of flower primordia under Taiwan conditions as influenced by date of planting. In general little or no difference was found.

* * *

Resistance trials for mosaic. S. L. LEU and Y. S. BAU. *Rpt. Taiwan Sugar Exp. Sta.*, 1958, (18), 24–31. —Trials conducted in 1958–59 with three strains of mosaic on 79 seedlings are briefly reported.

* * *

Growth and physico-chemical properties of sugarcane sap as affected by deficiencies of nitrogen, phosphorus and potassium. K. N. LAL and J. N. TANDON. *Indian J. Agric. Sci.*, 1958, **28**, 311–324.—Sand nutrient cultures were used to investigate the effect of N, P and K deficiencies on growth, juice quality and physico-chemical properties of sap. Canes under complete nutrition showed the highest density and viscosity of sap. N deficiency led to improved osmotic pressure, low total moisture, poor electrical potential, lower acidity and poor vegetative growth. Under P deficiency surface tension and specific electrical conductivity improved, density and viscosity were lowered. K deficiency reduced osmotic pressure, pH and bound water content. Leaf sap was invariably higher in specific electrical conductivity and electrical potential than the stem sap.

* * *

Utilization of distillery spent-wash and carbonation pressed as manure. S. CHANDRA *et al. Sharkara*, 1958, **1**, 179–182.—The potentialities for the use of spent-wash and press-mud are discussed in general terms without experimental backing.

* * *

Extension service scheme for the Indian sugar industry. ANON. *Sharkara*, 1958, **1**, 183, 184.—An outline is given of the newly formed extension service and its programme of work.

* * *

Cane purchasing system in Puerto Rico. R. F. GOODWIN. *Sugar J.* (La.), 1959, **22**, (1), 38, 39.—The somewhat complex system under which it is hoped growers may be paid for delivery for cane on a basis of quality is reviewed. The two regulating bodies are the Sugar Branch, Commodity Stabilization Service, U.S. Dept. Agric. and the Sugar Board of Puerto Rico. Juice quality is based on a sample of first expressed juice but, in final payment, allowances are made for delivery charges if paid by grower and for a share of the molasses.

Present status of sugarcane disease studies. J. ADSUAR. *Sugar J.* (La.), 1959, **22**, (1), 51, 52.—A brief survey is given of the position with regard to mosaic, particularly prevalent on B 34104, chlorotic streak, associated with POJ 2878, and ratoon stunting disease.

* * *

Effect of nitrogen, phosphorus and potassium on growth characters and physico-chemical properties of sugarcane sap. K. N. LAL and J. N. TANDON. *Indian J. Agric. Sci.*, 1958, **28**, 325–343.—Optimum requirements for N, P and K are indicated. Relatively, N was needed more for early vegetative growth while P and K were required in larger amounts at later stages of sucrose accumulation. On average N and K improved the growth of shoots more than that of the roots, while P improved root growth more than aerial growth. The significance of the relative effects of varying concentrations on growth, juice characters and physico-chemical properties are discussed in relation to general problems of sugar cane physiology.

* * *

Increased sugar production in Tanganyika. *Ann. Rpt. Dept. Agric. Tanganyika*, 1958.—The Tanganyika Planting Company have now 7000 acres under cane at Arusha Chini. Northern Province production for 1958 was 21,133 tons, a further substantial increase over previous years. Sugar cane cultivation, of about 400 acres, has now been started by a second company on two adjacent estates in Arusha District. A new sugar estate in Bukoba, Lake Province, has some 2000 acres under cane and has commenced producing white sugar. The production of jaggery in the Eastern Province remains at about 1,500 tons, most of which is sold to sisal estates in Kilosa District. An estate at the foot of the Eastern Usambaras in Tanga Province has some 300 acres under cane from which it produces an extract which is sold to sisal estates for local beer. The Tanganyika Planting Company has been troubled for many years by the cane chafer, and has now arranged to import the Scoliid Wasp from Hawaii in an attempt to control the pest biologically. New varieties of sugar cane imported into East Africa undergo two years of quarantine. For the first year they are grown under glass at Muguga in Kenya, after having been given heat treatment lest they carry ratoon stunting disease or an insect pest which could endanger the local industry. The second year of quarantine is spent at Kawanda in Uganda where the setts are plated in the open and kept under close observation. The bulking up of the setts of these new varieties is carried out in Tanganyika at the Morogoro Experimental Station.

KAWAIHAE BULK TERMINALS, HAWAII

WHEN the Hawaiian Islands gained their long cherished goal of statehood this past year, there were those who suggested the islands call themselves the "Sugar State." This suggestion was not made without cause, for Hawaii produces more than 30% of all the sugar grown under the American flag. Sugar today is Hawaii's major export product and one of the major developments for the island industry this statehood year was the opening of a new sugar port on the Island of Hawaii, largest of the chain and the one from which the new state takes its name.

Fig. 1.

More than one third of the islands' annual production of 1,000,000 tons of raw sugar is produced on Hawaii and some 100,000 tons of this comes from three plantations, Kohala Sugar Company, Honokaa Sugar Company, and Hamakua Mill Company located along the northern shore. For these companies, the long haul of bulk sugar to Hilo, until this year the island's only deep water port, was costly both in time and money.

For years these plantations looked longingly at Kawaihae Bay on the northwest coast. It was within easy hauling distance, had ideal climate for a bulk sugar plant, and offered other economic advantages. Unfortunately, however, it was a shallow water port used only infrequently by barges picking up cattle from nearby ranches. From time to time there was talk of developing a deep water port at this site, but, until recent years, the plans never progressed beyond the talking stage.

However, in 1956, the Federal Government authorized funds for such a harbour and in 1957 a combined Federal and state project was launched to create at Kawaihae Bay a sixth deep water port for the Territory, soon to be state, of Hawaii.

Even as the first construction began two Honolulu business firms, Castle & Cooke, Inc., and Theo. H. Davies and Company, Ltd., were investigating the feasibility of bulk sugar and molasses and cargo handling facilities for the port. Between them these two firms had substantial investments in all three of the interested plantations and acted as their agents. The investigation they undertook resulted in the birth of a new corporation, Kawaihae Terminals, Inc., formed jointly by the two agents and Honokaa Sugar Company, one of the plantations.

Construction of Kawaihae Terminals' physical plant began in December 1958. Now completed, the installation includes a modern bulk sugar plant to handle the storage and shipment of raw sugar, a bulk molasses operation, and the facilities to provide stevedoring, warehousing, and terminals services.

Total cost of the completed plant was in excess of $1,250,000 and would have been higher had not Castle & Cooke, the major stockholder in the terminal company and its agent, been able to provide from its staff the personnel to handle most of the designing and engineering work connected with the project.

Each of the three plantations now using the Kawaihae facilities grows its own cane and processes it to the raw sugar stage for bulk shipment to the United States mainland. Most of this sugar goes

ILLUSTRATIONS

Fig. 2.—Aerial view of Kawaihae harbour showing bulk sugar and molasses facilities. The large building is the bulk sugar warehouse. Conveyor systems can be seen running from warehouse to scale house and then on to loading facilities on the pier. The large single tank is for molasses storage while the other tanks comprise a storage and distribution station for petroleum and agricultural chemical products.

Fig. 3.—The nearly completed receiving station and warehouse for Kawaihae Terminals bulk sugar operation. Trucks enter the receiving station, on the left, to have sugar weighed and dumped. The sugar is then moved by conveyor into the 14,000 ton capacity warehouse for storage prior to shipment.

Fig. 4.—Kawaihae Terminals seen from an adjoining barge pier. Warehouse, scale house and pierside conveyor system are visible. The vessel is C-3 freighter of the Matson Navigation Company fleet and is of the type that normally calls at the port.

Fig. 5.—This dedication day scene at Kawaihae Terminals shows the overhead conveyor system on the pier as well as the loading gantry. Here the gantry boom is raised but in normal loading operations it would be extended over a vessel and a telescoping arm lowered into the hold.

Fig. 2.

Fig. 3.

directly to the California and Hawaiian Sugar Refining Corporation, Ltd., near San Francisco, which is co-operatively owned by all Hawaiian sugar producers.

From the plantation mills the raw sugar moves to the new bulk plant at Kawaihae in truck and trailer units capable of loading between 20 and 25 tons. These transport units go first to a receiving station where the sugar is weighed and then dumped into a receiving hopper. During the dumping process a composite sample is taken of each load. This entire operation, weighing, dumping and sampling, takes less than 10 minutes to complete.

A conveyor belt located under the receiving hopper delivers the sugar at approximately 200 tons an hour to a bucket elevator, which carries the sugar to another conveyor belt located at the top of the storage shed. This belt runs the full 260 foot length of the 14,000 ton capacity warehouse and, by means of a movable tripper and trimmer, can spot the incoming sugar anywhere on the storage floor that is desired. Height from floor to trimmer is 42 feet.

Located in a tunnel running the length of the warehouse below the storage floor is a line of 26 hoppers. Operated either manually or electrically, these hoppers control the flow of sugar during shipping by feeding it onto a series of two belt conveyors. A bulldozer is used to push the sugar from the sides of the warehouse to the hoppers.

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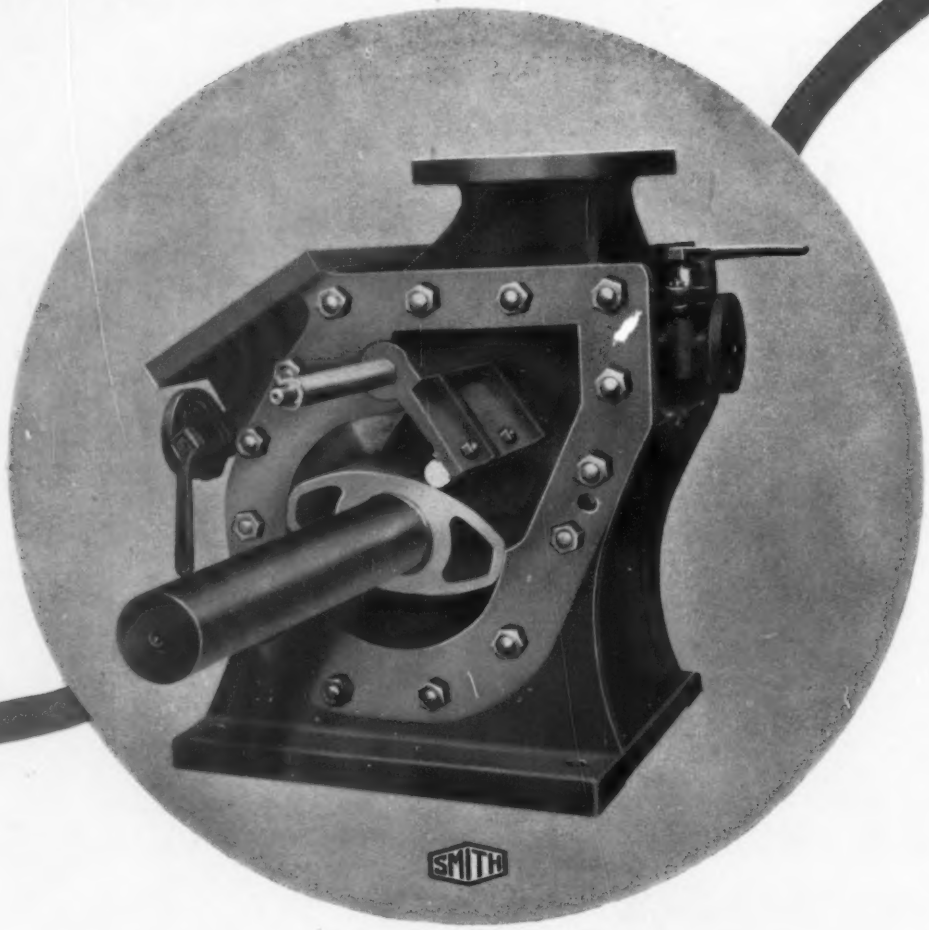

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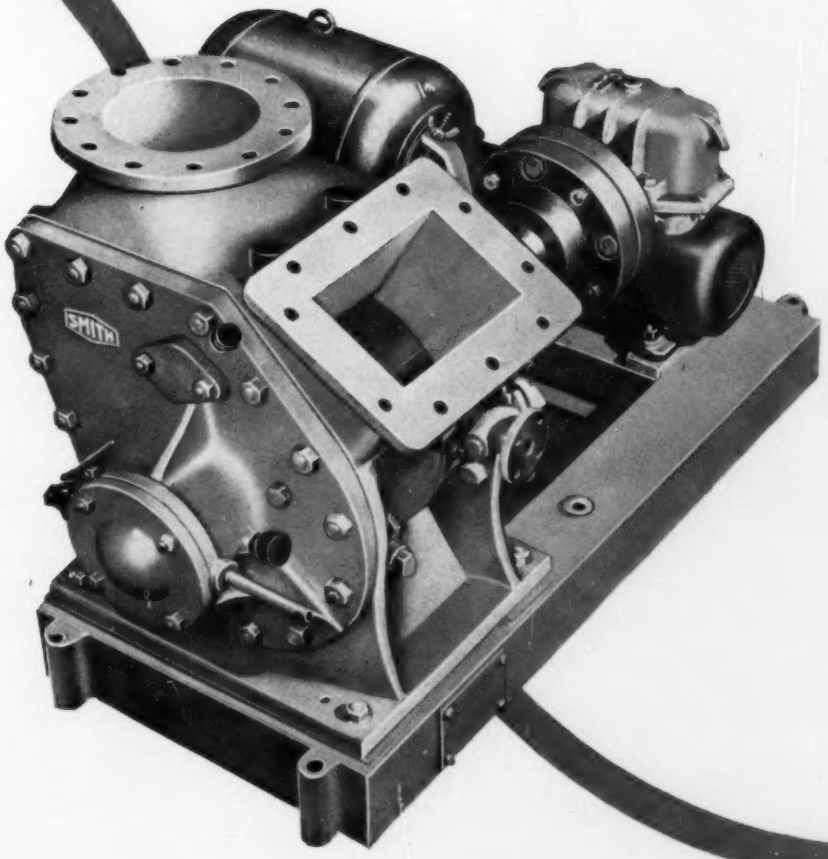

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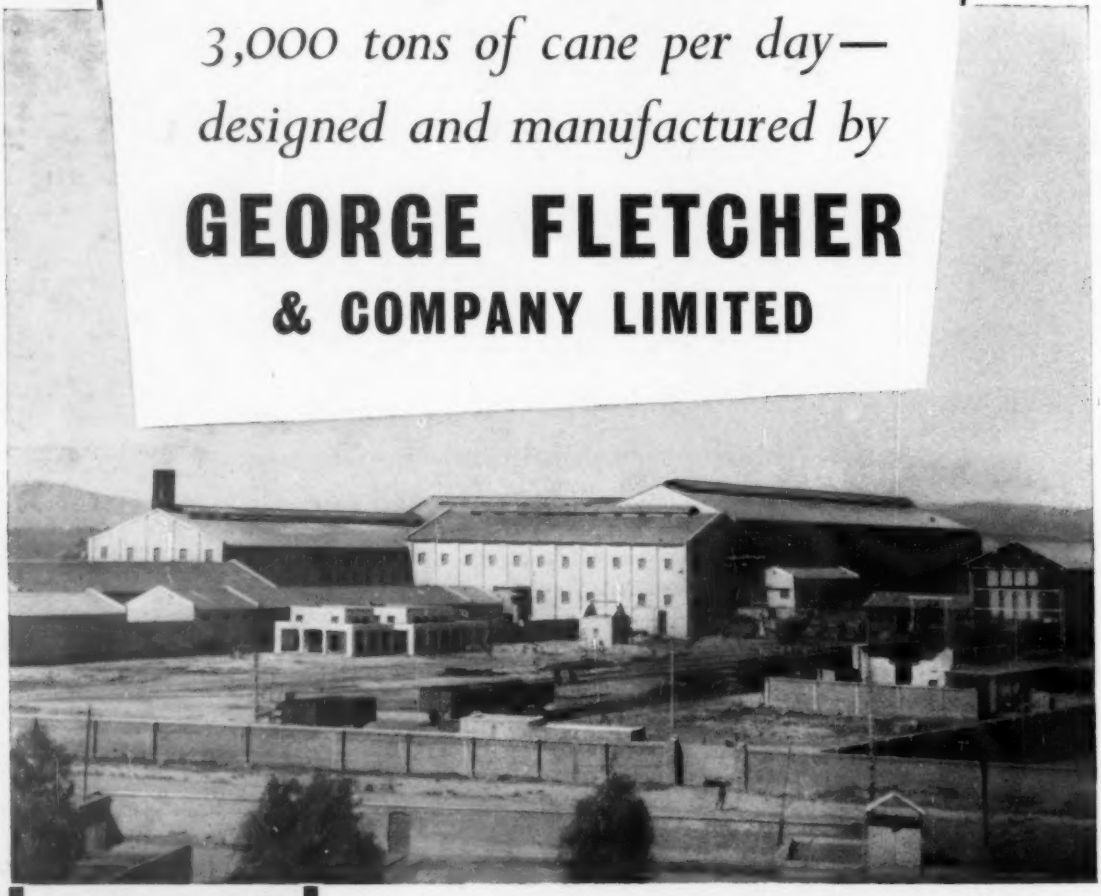

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From the storage area these belts move the sugar to a scale house equipped with three hoppers positioned vertically one above the other. The first, or top, hopper receives the sugar from the storage area in 10 ton quantities. The middle hopper weighs the sugar and the third, or bottom, hopper feeds it onto a belt conveyor for transportation to the loading facilities at pier side. A second belt, which runs above and parallel to the wharf, moves the sugar to the loading gantry itself.

The electrically controlled gantry rolls on tracks along the entire length of the wharf. During loading operations the gantry boom is extended over the vessel to be loaded and a telescoping arm is lowered into the ship's hold where a trimming device spots the sugar. Delivery rate for the gantry is in excess of 500 tons per hour.

At the end of the loading operations, an electric stopping device is used to clear all the conveyor systems of sugar. Starting at the warehouse tunnel, the belts are stopped progressively with the gantry belt being the last to shut down. This operation takes only 25 seconds to complete.

In addition to the bulk sugar plant, Kawaihae Terminals also maintains a bulk molasses storage and loading facility. Molasses is delivered from the plantations in tank trucks, weighed, and pumped into a 10,000 ton or 1,800,000 gallon capacity storage tank. It reaches the ship through a system of buried pipe-

Fig. 4.

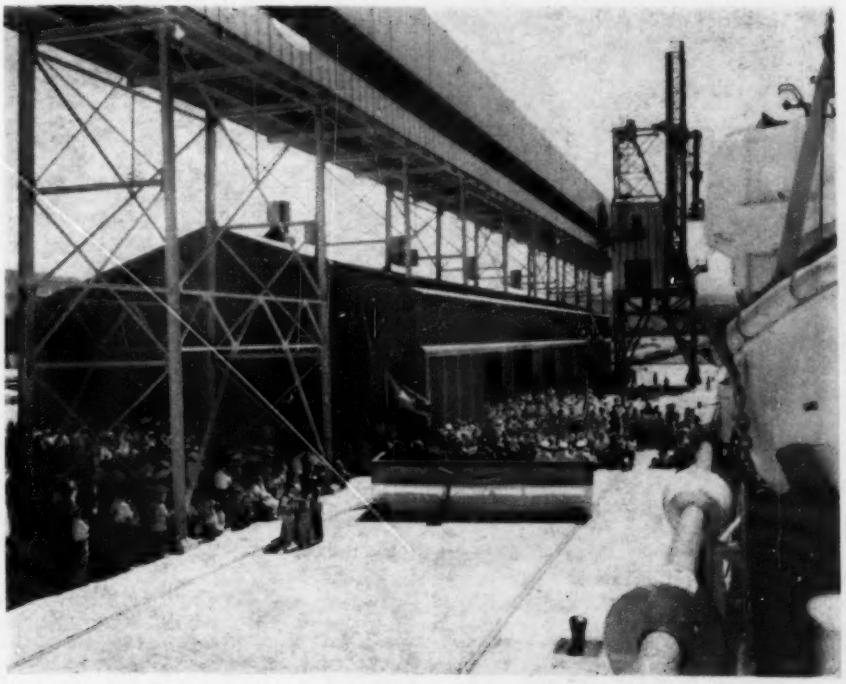


Fig. 5.

lines running from the storage tank to the wharf apron.

Though the storage and shipping of bulk sugar and molasses will provide the major activity of Kawaihae Terminals in the immediate future, the surrounding area has great potential for growth and the company has outfitted itself to meet this growth. It is already equipped to handle general stevedoring and to provide terminal services for vessels calling in the port. It has built a warehouse to facilitate cargo handling and storage and it operates a tank farm and distribution station to service the area with petroleum products and agricultural chemicals.

By comparison with the great sugar ports of the world Kawaihae Terminals is, admittedly, a small operation, but it is based on a firm belief in the future growth of the new state of Hawaii and of the importance of sugar to that future.

CANE STORAGE

By L. A. TROMP, A.M.I.Mech.E.

PART II

In Fig. 8 can be seen the lifting of a 12 ton load in this lofty cane shed, which may be stored or deposited on an inclined platform, from which operators rake the cane by hooks into the carrier. It should be noted that the cane is carefully stowed, but this is not required where multiple chains or cables are used.

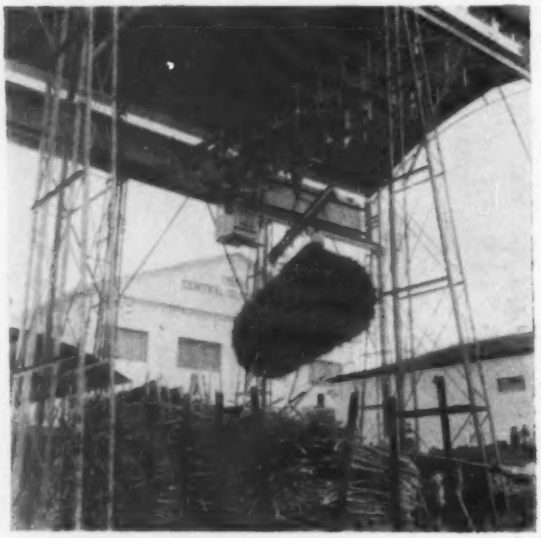


Fig. 8

The shed comprises six bays of 40 ft × 20 ft and has ample storage capacity for further increase of the actual grinding rate of about 1000 tons per 24 hours. Where timbers of sufficient section and length as well as high tensile strength are available, this material can be used for building a cane shed as shown in Fig. 9. The double bay has been considered a valuable feature by the designing engineer as also was lifting by electric monorail trolleys. It will be obvious that with 2 hoisting apparatus, whether overhead cranes or trolleys, one can be used for storage and the other for feeding the mill independently. This arrangement is to be preferred over two or even three cranes on the same gantry in an extended cane shed. In addition, the disadvantage of cane being left over is avoided, as storing and feeding do not interfere with each other.

The monorail trolleys have a small cabin attached in which the operator travels back and forth with the trolley, running on the lower flange of a 18 in × 6 in I beam. There are thus only 2 operations, i.e. hoisting and travelling without traversing. Although an experienced crane operator of an overhead travelling crane can perform the three motions simultaneously, it should not be assumed for calculations of hourly capacity, because storing conditions may not permit.

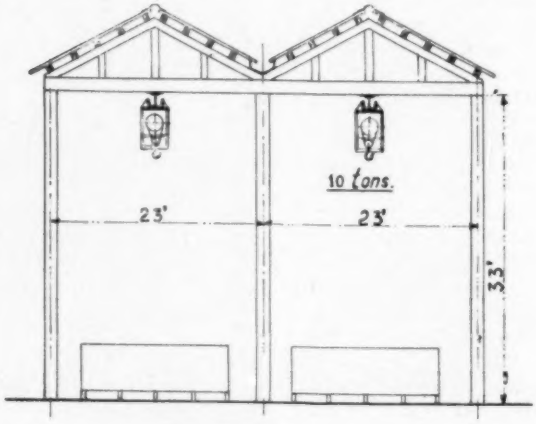


Fig. 9

For feeding the cane carrier, the cane is unloaded in "taboleiros", which are bowl shaped troughs rocking over rails with a variable fulcrum, as can be seen in Fig. 10. When receiving the cane, the troughs are placed horizontally and, from an elevated control

point, are tilted by means of a screw spindle in the rear operated by an 1 h.p. electric motor, so as to permit the cane to be raked manually on to the relatively narrow and shallow cane carrier. The design bears witness to the engineer's ingenuity and has rendered a satisfactory performance during some 6 years.

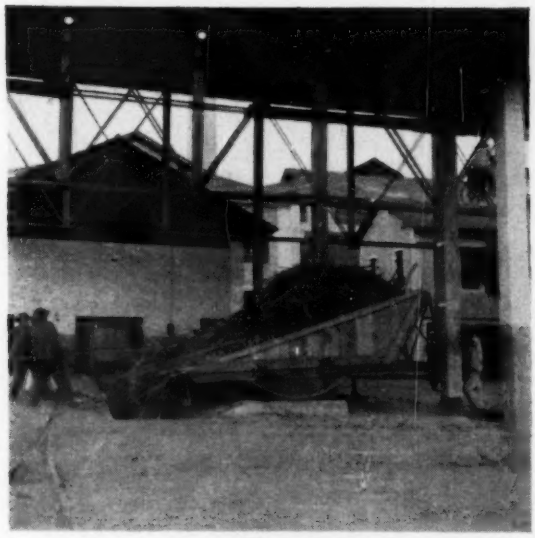


Fig. 10

The trolley has been drawn in detail in Fig. 11, the hoisting drum being parallel to the runway with the geared electric motor in front. The travelling motor with its gear has been arranged on the side of the wheel carriage. Ten double bays of 23 ft × 16 ft

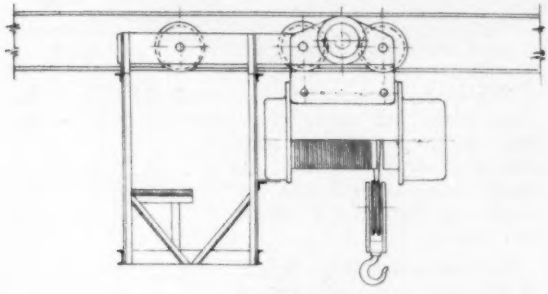


Fig. 11

give sufficient storage space for at least 500 tons of cane. If the roof trusses were located at 36 ft above floor level about 200 tons more could be stored, depending upon the size of the bundles, which as a rule are from 8—10 tons each.

A different design of a cane shed with two monorail trolleys is shown in Fig. 12, both having 10 tons hoisting capacity, and with the gantry-beams suspended on the well proportioned roof trusses. In Fig. 13 showing from the front of the shed, cane storing is in actual operation and from the side view in Fig. 14 it can be easily seen that large quantities of cane up to 3 or 4 bundles high can be located within this shed comprising 7 bays of 46 ft × 16 ft.

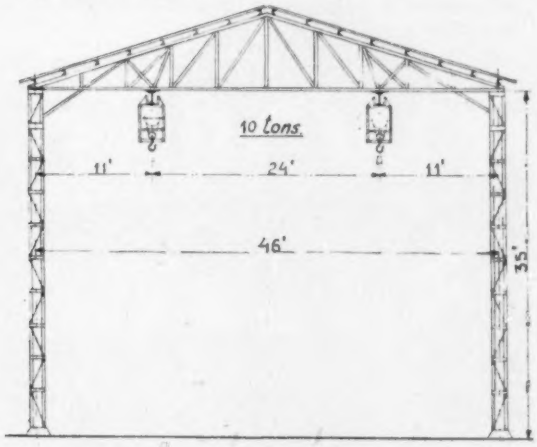


Fig. 12

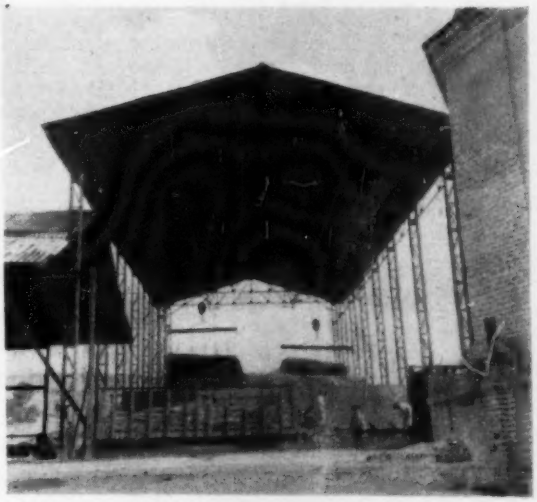


Fig. 13

Storage Calculations

Not only the floor area is of importance for calculating cane storage, but also the speed and the lifting height of the hoisting equipment. For overhead travelling cranes or trolleys the following speeds may be taken as average ones :

travelling speed ..... 300 ft/min,
traversing speed ..... 100 ft/min,
hoisting speed ..... 36 ft/min.

It will be obvious that the crane for storage as well as the one for feeding the mill must be able to cope with the hourly grinding rate when two cranes are in

operation, one for feeding the mill and the other for storage. However, the cane does not always arrive at the factory in accordance with the grinding rate of the mills and for each instance a service factor should be included to make up for these irregularities in the cane supply.

As mentioned before, travelling, traversing and hoisting can be done simultaneously, but consecutive operation should be allowed for in the calculation.

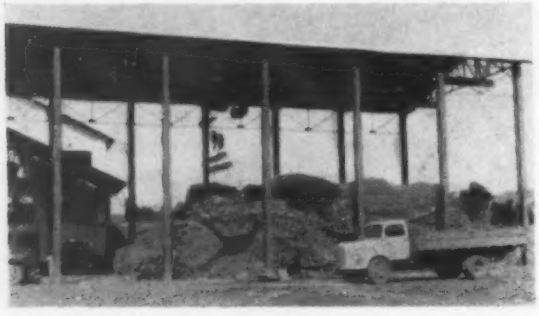


Fig. 14

Moreover, 2 minutes should be added to each cycle for attaching and detaching the chains or cables, as well as for the return travel of crane and trolley. In practice there will be little difference in time saving, when the cane is dropped by a releasing chain gear instead of storing bundled cane.

The hourly capacity of a crane, having the aforementioned speeds, will be :

$$C = \frac{60}{L/300 + T/100 + H/36 + 2} \times W_b$$

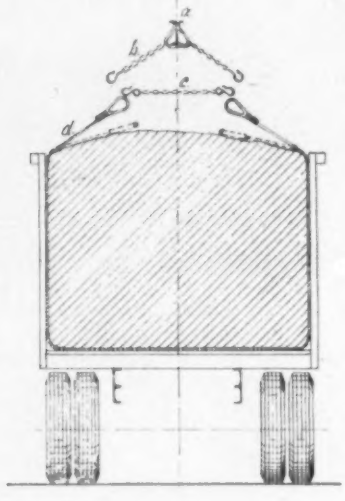


Fig. 15

in which :

L = total travel on the gantry in ft.
T = total traverse of the trolley in ft.
H = maximum lifting height in ft.
W_b = bundle weight in tons.

Although there is no traversing with monorail trolleys the time required to do so is of little importance. It will be noted at once that the bundle weight is the deciding factor for the crane capacity and the tendency is to have large bundle weights, for which the crane, of course, must be adequately dimensioned.

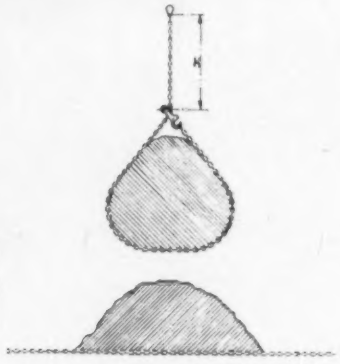


Fig. 16

Chains and Cables

Chains have the advantage that they can be easily repaired and shackles can be easily made by autogenous welding. Cables, however, are easier to manipulate because of their much lower weight, as may be seen from the table below. For good flexibility and rough usage the cable with 6 × 19 wires is generally recommended.

diameter	*weight per ft.*	*breaking strength*
chain $\frac{1}{2}$ in	2·55 lb	18,500 lb
cable $\frac{1}{2}$ in	0·40 lb	16,000 lb

Cables should have thimbles inside the eyes on the cable ends, but as splicing requires craftmanship and much time, U-bolt clips are more easily applied. A safety factor of 4–5 will increase the life of the chains and cables.

To reduce the lifting height of the crane or to allow more bundles to be stored one on top of the other, slings are hung before loading over the sides and inside the body of the conveying equipment, as shown in Fig. 15. On the spreader beam "a" are fastened a number of chains "b" on both sides, which can be hooked into the eyes of the slings "d" for hoisting,

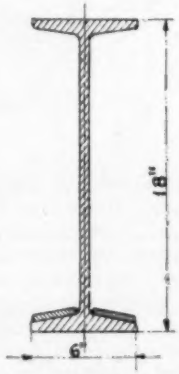
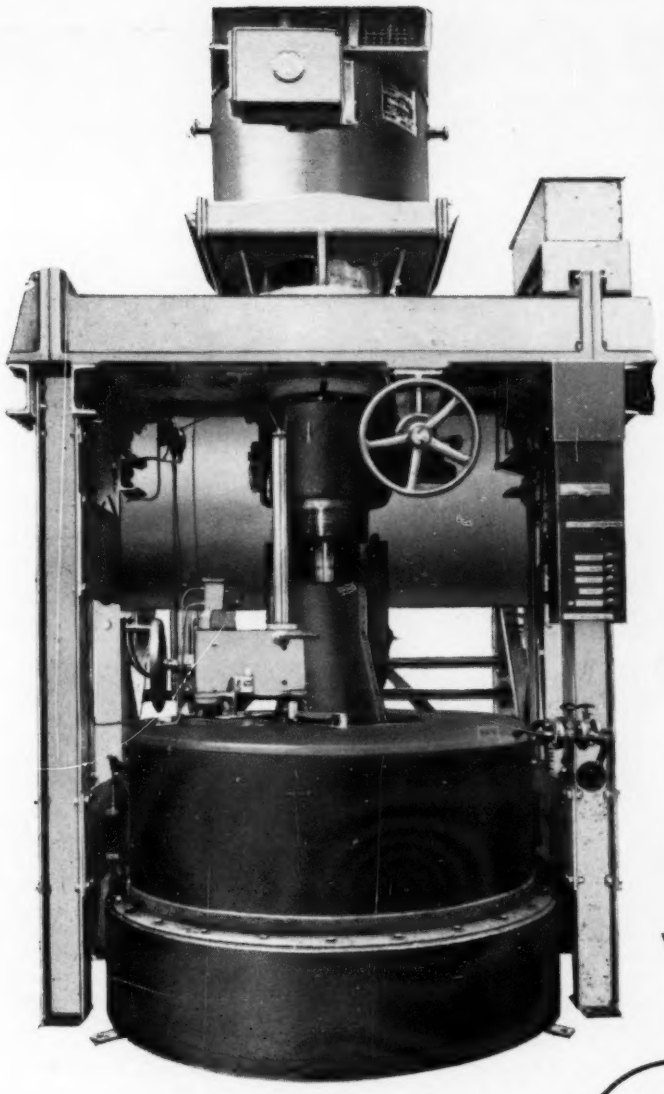


Fig. 17



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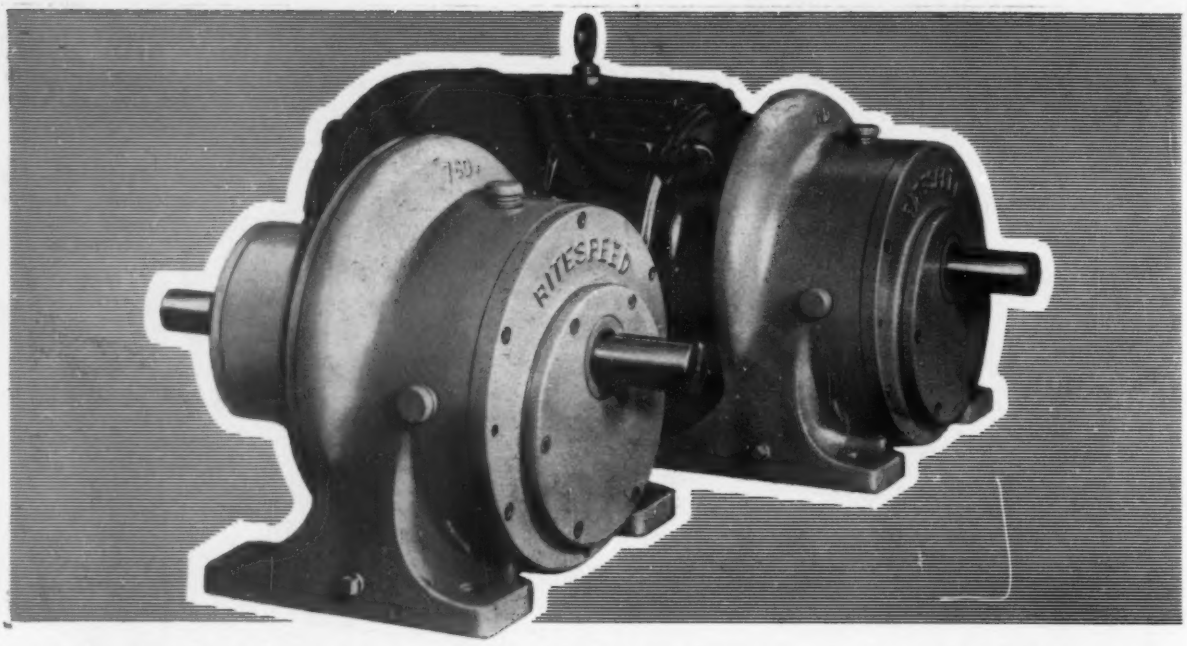

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which also will be a saving on the lengths of the slings.

When the bundles have to be stored, short pieces "c" of chain are hooked into the eyes of the slings which, on lowering the load, will keep the bundle tight. So as not to loosen these short chains, they can have a fixed eye attached to the slings. If the spreader beam has a releasing gear, one set of the chains "b" can be provided with releasing hooks. Now it may be necessary to bundle the cane in the field, as shown in Fig. 16, the cane being loaded by hand or by a cane grab operated by a crawler type field derrick. With a normal length of the chains from 18–22 ft and having a releasing hook, a dead end "x" of 4–8 ft normally results on tightening the bundle especially when bundles of 2–4 tons are gathered. This implies that the crane gantry must be placed at a higher level in order to have the same storage capacity in the shed as with the bundle attachment as shown in Fig. 15.

Maintenance of Cranes

When properly painted and not overloaded, cranes and trolleys have low maintenance expenses, only new brake linings being required from time to time. In the dead season the crane should be under a roof, as there are gantries, which are not covered.

On one particular occasion the lower flange of the supporting beam of a monorail trolley was worn down to such a degree that buckling occured, possibly through overloading. It should be therefore good practice to weld flat irons on these flanges as indicated in Fig. 17.

£1,000,000 REFINERY COMPLETED AT GREENOCK

A GREAT possibility that Scotland's oldest sugar refinery would have had to close, had not bulk-handling facilities been installed at Greenock, was announced by Mr. Hugh B. Walker, director of John Walker & Co. (Sugar Refiners) Ltd., on Thursday November 26th, 1959.

Mr. Walker was speaking at a luncheon in Greenock given to mark the completion of the company's £1,000,000 scheme of reconstruction and modernisation.

"The introduction of bulk-handling has led to a very sharp drop in the number of men needed to unload raw sugar and ships can be cleared of their cargoes in less than half the time previously taken", he said, "but these were secondary considerations in arriving at our decision to go in for bulk-handling.

"By far the most important was that unless we did so it was very possible that in a few years time we should have been forced to close the refinery altogether. All the sugar-growing areas of the world have or are about to have bulk-loading facilities, and it is going to be practically impossible to obtain a steady supply of bagged sugar. It is obvious that if we could not obtain bagged sugar and we could not handle sugar in bulk, then the local industry would die, Greenock would cease to be a refining port and more than 1000 people would have been thrown out of work"

But for the war, the reconstruction of the refinery would have been completed in the early nineteen-forties. It was not until 1953 that the necessary permit to go ahead was obtained. What stands today is virtually a new refinery, the major exception being the char house—and that will almost certainly be re-built and re-equipped within the next two or three years.

Possibly the biggest single improvement has been the introduction of bulk handling at the James Watt Dock, which has revolutionised the landing of raw sugar at the Port of Greenock.

To do this three travelling cranes, each fitted with 2½-ton grabs, and three 25-ton mobile hoppers were installed at the Dock. A fleet of specially-designed tipper trucks was created to carry the sugar from the hoppers to the refinery.

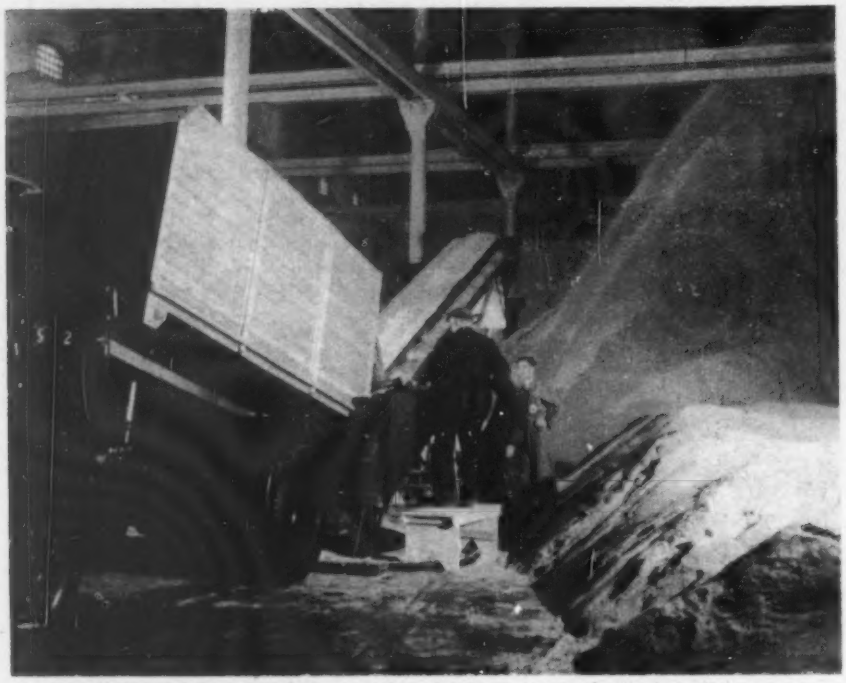
Among the results have been an 80 per cent reduction in the number of men required at the Dock, unloading has speeded up so that a 9000 ton cargo can be cleared in 40 working hours instead of 96, and it can now continue in all weathers whereas in the past, heavy rain or snow led to expensive stoppages.

Designed and equipped to operate at the highest pitch of efficiency, the Greenock refinery is now among the most modern in the world. A number of the processes are almost fully automatic. Among its new features are : a silo capable of storing 5000 tons of raw sugar, fed by twin elevators, each 135 ft. high and each able to handle 100 tons per hour; a recovery house using the most up-to-date machinery; and automatic centrifugals which rotate at 1100 revolutions per minute compared with 750 r.p.m. achieved by those which have been discarded.

Unloading squads of 12 or 14 men have been replaced by two silo attendants. A further innovation —the first of its kind in Britain—has been the pneumatic delivery of granulated sugar to customers. This has the advantages of greater cleanliness, lower packing material costs and the saving of labour to both the refiner and the customer.

The company handles approximately 2000 tons of sugar per week, 800 tons of it going into 1 lb and 2 lb packets for Scotland and Northern Ireland. Syrup and treacle are also manufactured.

Mr. Walker said it might be thought that sugar refining, having recovered from the artificial restraints of rationing, would be fairly static. In fact, sugar consumption in Scotland was rising steadily and allowing for the increase in population was now about



One of the specially designed tipper trucks unloading raw sugar in the dock shed on to a mobile conveyor belt. From the belt, the sugar is thrown by a high-speed thrower onto a pile from which it is conveyed to the refinery silo as required.

Battery of affination centrifugals.

25 per cent higher than before the war.

"So far as I can judge, very little more has gone into cups of tea", said Mr. WALKER. "But in the form of jam, ice-cream, biscuits, soft drinks and confectionery, Scotland's tooth has undoubtedly become sweeter. The brewers too, are taking more sugar than they used to, which may indicate a change in the taste for beer".

Regarding price, Mr. WALKER said that the cost of sugar to the housewife had risen less since pre-war than almost any other household commodity.

"In 1939 our sugar was selling in the shops at 3d. a lb; today it is about 8d. The cost of our raw sugar, after payment of freight and duty is at present approximately 5½d per lb; we sell it for about 6½d. The penny difference is not profit—out of that we have to pay the cost of refining, find the money for more than 400 pay packets each week, pay for plant replacement, packaging, distribution, taxes and the scores of other outlays required in any business. Our net profit works out at one-seventh of a penny per pound.

"You will see therefore that if there is any chance of lower sugar prices—and I don't think there is at present—it could hardly come from the refiner. All I can say is that as a result of the completion of this new refinery, and assuming there is no excessive fluctuation in the price of raw sugar, we should be able to hold the price at a lower level than would have been the case otherwise".

Beet Factory Notes

Corrosion in steel tube evaporators in sugar factories. F. SCHNEIDER, W. HOFMANN, A. EMMERICH and H. GIESEKE. *Zucker*, 1959, **22**, 450–462.—The literature on evaporator corrosion is reviewed (28 references). The answers to a questionnaire, sent out to 71 West German sugar factories, on corrosion (juice- and vapour-side) are evaluated and details are given of an experimental evaporator constructed by Buckau R. Wolf to the specifications of the authors and installed in Barum sugar factory. Tests with the evaporator are discussed in detail with graphs and photomicrographs. Generally it was found that copper deposits can lead to considerable electrolytic corrosion and even pitting, which is caused by the high potential difference between the copper and iron and is accompanied by generation of hydrogen. Corrosion caused by oxygen is not proportional to the oxygen content of the juice. No connexion between corrosion and composition, structure and hardness of the tubes has been detected. Cavitation can play a leading role in materials destruction. Preventative measures against corrosion are suggested.

* * *

Determination of sugar losses in carbonatation muds. S. ZAGRODZKI and H. ZAORSKA. *Gaz. Cukr.*, 1959, **61**, 233–238.—Cf. *I.S.J.*, 1959, **61**, 117.

* * *

A new method of boiling-out evaporators. ANON. *Gaz. Cukr.*, 1959, **61**, 246.—At Chelmza sugar factory, the evaporators are boiled out for 8 hr with 3–4% Na_2CO_3, 1·5–2·0% Na_3PO_4 and 0·8–1·0% NaOH. The softened scale is then removed by water jets.

* * *

Tests with hydrocyclones for second carbonatation juice. O. ASP. *Socker Handl.* II, 1959, **15**, 15–24.—Five Nichols-Freeman "Vorject 306" hydrocyclones were used at Skivarp at the end of the 1958 campaign for treating 2nd carbonatation juices which then went to the filter presses after adding untreated juice. The sludge from one of the units was added to the 1st carbonatation juice tank as a filter aid, while the sludge from the remaining four units was added to the filtered 1st carbonatation juice before 2nd carbonatation. This was intended to reduce the $CaCO_3$ supersaturation in 2nd carbonatation juice and thus lessen the scaling of pipes and heaters; in fact, the rate of scale deposition in the pipelines fell from 0·35 mm/day to 0·15 mm/day. The sludge content of the treated juice was reduced from 0·97 g/litre to 0·33 g/litre, but this is still too high to allow to pass to the evaporators without filtration. Photomicrographs illustrate the types of particles in 2nd carbonatation sludge and the effect of the saturation conditions is discussed. A theoretical formula has been deduced for the mean size of the aggregate particles: $m = k_o ta\,(a^o + 1)$, where m is the mean number of primary particles (about 3μ dia.), t is mean retention time in the carbonatation tank, a is the decrease in alkalinity of the juice, a^o is the recycled sludge as a fraction of the sludge precipitated in the carbonatation tank, and k_o is a constant characterizing the tank but governed by the juice purity and final alkalinity of the carbonatation. Thus the number of particles in the aggregates may theoretically be doubled by doubling the retention time, adding double the quantity of lime to the juice to be treated, and returning 100% of sludge to the juice. While it would not seem practicable to increase the completeness of sludge removal in the hydrocyclones by increasing aggregate sizes and so sedimentation velocity, the recycling of sludge should increase the proportion of sludge removed to such an extent that the remaining particles can be removed merely by leaf filters. The incomplete practical data from the 1958 campaign did not verify the theory.

* * *

The theory of hydrocyclones and their application in the beet sugar industry. T. M. LES'KIV. *Trudy Moskov. Tekhnol. Inst. Pishchevoi Prom.*, 1958, **11**, 89–101.—Theoretical equations are derived for hydrocyclones treating carbonatation juice. These show that increasing the velocity of the mud particles by narrowing the cone and increasing the distance between feed and discharge nozzles will increase the capacity. Graphs and data are presented of factory tests on 1st carbonatation juice heated to 90°C and fed at 3–9 atm.[1]

* * *

The effect of polluted pond water used in diffusion on the technological properties of the work of a factory. A. K. KARTASHOV and A. K. GOPAK. *Sakhar. Prom.*, 1959, (9), 11–14.—At Shpolyansk factory difficulties in juice filtration were attributed to the use in diffusion of heavily polluted water from the pond, to which diffusion water and filter press mud had been discharged for some months, as well as flume water. The diffusion water was turbid, dark in colour and smelt strongly of H_2S. Tests were made, with pond water and mains water, on diffusing poor quality and well stored beet in two identical Krasil'shchik diffusers. Cossette quality, draught, retention time and temperature were the same for both diffusers, and the raw juice was purified as normally. With poor beet the purity of the juice from the "polluted" water diffuser was 1·5–1·6 units lower than that using mains water, the colloidal content increased by 150% and the CaO content in the 2nd carbonation juice by

[1] *See I.S.J.*, 1959, **61**, 20.

more than 200%. It was almost impossible to filter the 1st carbonation muds through paper. Similar differences in results were obtained with the good beet. No improvement was effected by omitting main liming and adding 0·1–0·3% CaO to the 1st carbonatation tank, and addition of 0·1–0·15% CaO to the 2nd carbonatation juice had no effect, the $CaCO_3$ particles passing through the cloth, although 0·3% CaO did improve filtration, the filtrate being clear. It is considered probable that the difficulties in filtration were caused by the presence of dextran or fructosan, formed by bacterial action in the pond water; other authors have found that, in the presence of these polysaccharides, the particles of $CaCO_3$ formed in 2nd carbonatation are so fine that they pass straight through the filter cloth. The need for adequate water purification and the inexpediency of discharging diffusion, press and flume water, which contain much bacteria, to ponds are emphasized.

* * *

The application of hydrocyclones in the lime section of Bobrovitsk factory. V. A. ZAMBROVSKII. *Sakhar. Prom.*, 1959, (9), 15–20.—Three hydrocyclones of 75 mm dia. each with a mud discharge nozzle 10 mm in dia. and a rectangular feed nozzle 7 × 32 mm (equivalent to a circular nozzle of 16·9 mm dia.), were installed for sand removal from the milk-of-lime. Performance data are tabulated and show a purification efficiency of 97%, with concentration of the sand to 21 times the original. At a feed pressure of 1 atm one hydrocyclone can supply more than the factory requirements of 3·75 cu.m./hr. A diagram is presented of a scheme in which the concentrate from the 3 hydrocyclones passes through a sand-trap before recirculating to the hydrocyclones. A disposal scheme for the sand, using dumping trucks, is also described.

* * *

The calculation of throughput of a separation (Steffen or barium process) plant. V. I. CHOPIK. *Sakhar. Prom.*, 1959, (9), 20–21.—The normal method of calculating the output of a separation plant is based on the amount of sugar in the original molasses entering the plant, minus that amount lost to the discard alkali. Of this sugar, that part going to the bags and that part returned to the molasses is determined from the saccharate purity. Determination of the sugar in the discard alkali is difficult, as a large amount of foam is formed and makes determination of the volume in the tanks difficult. As an indeterminable amount of alkali is lost before the scales, accurate weight determinations are impossible. It is suggested that determination of the weight of the saccharate milk on special scales would give a more accurate result.

* * *

Causes of increased final molasses yield at Chernovitsk sugar factory. M. A. KOKHAN and E. T. SIMAKOVA. *Sakhar. Prom.*, 1959, (9), 21–25.—The sugar losses in molasses at Chernovitsk factory in 1957 and 1958 were greater than those at "Kreshchatik" factory, although the factories are near to each other and use beet of almost identical quality. The greater losses are attributed to: a longer diffusion cycle; more lime added in defecation; longer main liming period; 40–60% less juice recirculated; higher lime salts content in the syrup; larger evaporator h.s. and higher temperature in evaporation; low massecuite Brix, and consequently inadequate exhaustion of intercrystalline molasses; shorter crystallization period for 3rd product; inadequate cooling of the 3rd product before spinning. These faults have been remedied, so that the molasses yield has been considerably cut.

* * *

Variation in the viscosity of intercrystalline molasses in massecuite centrifugalling. A. M. ZABOLOTSKAYA. *Sakhar. Prom.*, 1959, (9), 25–26.—Tests were made at the Stalin factory to determine the effect of cooling on the viscosity of the intercrystalline molasses during 15 min spinning of 2nd product massecuite. Massecuites of approximately 60°C temperature suffered loss of heat during spinning, so that the temperature of the yellow sugar towards the end of spinning was from 4 to 8° lower than that of the massecuite. The viscosity of the molasses film on the crystals was 2½ times greater than that of the massecuite intercrystalline molasses. The viscosity of the molasses film increased by 1·3–1·5 times on the massecuite molasses after 15 min spinning at 39°C with steam. To yield a yellow sugar of 93–94 purity, the massecuite temperature before spinning must not exceed 50°C, as a drop in temperature cannot be avoided with a massecuite of 55–60°C and this leads to a drop in the sugar quality.

* * *

Results of tests in the application of prewashing with syrup in affination. J. BURES, J. MAZURA, M. RUZICKA and J. NEMECEK. *Listy Cukr.*, 1959, **75**, 225–227.—An apparatus for prewashing of low-grade massecuite is described and illustrated. Green syrup or molasses is delivered from the storage tank through a heater to an oscillating drum and hose pipe unit with a spray attachment, mounted on the centrifugal. The syrup is heated to 90–95°C. In one case spraying is commenced at the same time as the massecuite is fed into the basket. The colour of the sugar has been reduced and molasses yield is lower. A saving in fuel has also resulted from the reduction in water requirements.

* * *

Automatic pH control in juice purification. K. CIHAL. *Listy Cukr.*, 1959, **75**, 230–235.—The applicability of various methods of automatic pH control of preliming and main liming, 1st and 2nd carbonatation and sulphitation is discussed, with 30 references to the literature. Independent automatic pH control is considered inadequate for the majority of cases, with the exception of CO_2 regulation in second carbonatation by means of a differential pH meter. In other cases it is necessary, for fully automatic control, to combine the pH meter with a regulator for e.g. juice flow and milk of lime feed.

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LABORATORY METHODS AND CHEMICAL REPORTS

Analysis of liquid sugars. E. J. McDONALD. *Proc. 5th Tech. Session Bone Char*, 1957, 77–82.—Procedures for routine determination of total solids, invert sugar and sucrose in sugar liquors are examined using synthetic solutions of known composition, and attention is drawn to their limitations.

* * *

Photometric study of the lye test. K. LÖWY. *Proc. 5th Tech. Session Bone Char*, 1957, 137–144.—A method is described whereby adsorption of the lye extract is measured at 420 mμ instead of graded visually against colour standards. The method takes 7 min as opposed to 6½ min.

* * *

Effect of stratification and vacuum settling on column testing of granular adsorbents. R. S. BOWMAN and M. MALANCHUK. *Proc. 5th Tech. Session Bone Char*, 1957, 179–200.—Steam vacuum deaeration was found to increase the upward-flow column test performance of service chars but not new chars, the decolorizing power of which appeared to be slightly worsened. Char bed stratification increased column performance, the direction of stratification having some effect. When some channelling occurred at the top of the column the best performance was achieved with the most active char at the bottom ; when flow was more uniform the best performance was obtained with the most active char at the top, except in the case of new char.

* * *

Laboratory column tests for evaluating granular adsorbents. N. L. PENNINGTON. *Proc. 5th Tech. Session Bone Char*, 1957, 201–223.—Previous work on a laboratory column test for adsorbent evaluation is summarized and an account given on the test as modified and used at Crockett refinery. The test results have good reproducibility, and, although not precisely related to plant-scale colour removal, are adequate for rough estimation. The laboratory test appears to give a direct measure of plant-scale ash removal.

* * *

Comparison of column decolorization experiments with theory. W. V. LOEBENSTEIN. *Proc. 5th Tech. Session Bone Char*, 1957, 253–278.—A relatively simple two-parameter equation has been derived from theoretical considerations of adsorption of sugar liquor during passage through packed bone char columns. The equation is based on the Langmuir adsorption equation and, this, since it is not strictly valid, provides an approximation to experimentally observable conditions. The acceptability of this approximation can be resolved in terms of a number of requirements and these are tested by means of data obtained experimentally at Tate & Lyle Ltd. Statistical analysis of the values of the two parameters involved confirmed that it was feasible to scale-up from laboratory to refinery conditions. Further work indicates that the same characteristic parameters are derivable from laboratory batch decolorization results, and substantially agree with the column results.

* * *

Sugar retention by char. F. G. CARPENTER. *Proc. 5th Tech Session Bone Char*, 1957, 279–295.—A technique is described which has been used to determine the adsorbed sucrose which cannot be removed from char by washing. The char is dried at 105°C, usually for about 3 hr, and a 10–40 g sample placed in the sample bulb of the apparatus. A gas sample bulb is attached and the apparatus evacuated, the char bulb being immersed in a thermostatic oil bath at 200° for 10 min. The vacuum is turned off and the bulb is removed, wiped dry and placed in an air furnace at 400°C for 40 min. The sucrose is pyrolysed, producing gases which enter the gas sample bulb; the latter is disconnected and its H_2 and CO contents analysed by gas-phase chromatography. Calibration data are obtained by using a char to which known amounts of sucrose have been added, and it is found that a good refinery char will retain 0·35–0·45% by weight. Corresponding retentions for granular activated carbon and powdered activated carbon were respectively 6% and 18% sucrose on weight of adsorbent.

* * *

Removal of organic anions by bone char. V. R. DEITZ and H. M. ROOTAVE. *Proc. 5th Tech. Session Bone Char*, 1957, 297–323.—Total cations ($Ca^{++} + Mg^{++} + Na^{+} + K^{+}$) minus ($SO_4^{--} + Cl^{-}$) provides a measure of the organic anions present in sugars and juices. Such analyses indicate that the quantity of organic anions lay between 23 and 83% for 15 cane sugars of various origins. Analysis of refinery liquors from the melter, from the clarifier, and off char, compared with original sugars, show that affination removed about half of the organic anions, while a significant part of the remainder was removed in clarification. Ionic concentration changes off char were variable and were studied further using a laboratory column. The results illustrate the adsorption, ion exchange and displacement reactions discussed by GEE[1]. Part of the organic anion fraction is colourless (carboxylic) while the remainder are chromophoric. The concentration of organic ions in a liquor off char is found to be linearly related to the attenuation index at 420 mμ, the slope of the line depending on the char and the intercept with the ordinate depending on the colour due to substance other than organic anions. This relationship indicates the possibility of expressing the magnitude of sugar colouring matter in terms of anionic concentration.

[1] *I.S.J.*, 1960, **62**, 46.

Paper chromatographic study of carbohydrates. F. SCHNEIDER and A. EMMERICH. *Zucker*, 1959, **12**, 402–407.—Quantitative and qualitative paper chromatographic determination of sugars is discussed with 22 references to the literature. Examples are given illustrating the use of chromatography in the study of decomposition, reversion and transportation reactions. The Lobry de Bruyn-van Ekenstein transformations and the formation of oligosaccharides from glucose and fructose on heating in alkaline, neutral and acid media are discussed.

* * *

Table for determination of the Clerget factor in determination of true sucrose from dry matter %. R. B. ACOTTO. *La Ind. Azuc.*, 1959, **65**, 282–285.—The Clerget factor allows for variation in dry matter % of the original solution and also for temperatures other than 20°C. Three tables are drawn up, the first giving the factor for dry matters of 10—19·9%, in 0·1% intervals, and the second for the range 80–99·8% dry matter in 0·2% intervals, all at 20°C. The third table gives the correction to the factor which must be made for temperatures of 20·1°C to 30·9°C in 0·1°C intervals. The use of two of these tables saves calculation of the Clerget factor from the formula. Examples of the use of the tables for a juice and molasses are given.

* * *

Microbiological testing methods in the sugar industry. O. VAJDA. *Cukoripar*, 1959, **12**, 95–100; through *S.I.A.*, 1959, **21**, Abs. 555.—Various methods of making bacterial counts, and methods of sampling, with the equipment used, are described. A new simple industrial method, in which live counts are made in agar in a test-tube after 12–16 hours' incubation, is described in detail. The results are in agreement with those obtained by the usual methods for control work.

* * *

Approximate calculation of the specific gravity of sugar solutions containing a third component. G. VAVRINECZ. *Cukoripar*, 1959, **12**, 83–84; through *S.I.A.*, 1959, **21**, Abs. 558.—When a third component, i.e. a non-sugar, is present, its specific gravity expressed as Brix has approximately the same ratio to the Brix of sugar as the density of the solid non-sugar to the density of the sugar. If p_n and p_c are the % of non-sugar and % of sugar, by weight, respectively, the apparent Brix $S = p_c + p_n \cdot C = p_c + p_n \frac{d_n}{d_c} = p_c + p_n \frac{d_n}{1{\cdot}5}$, where d_n = density of solid non-sugar and d_c = density of solid sugar. Of mixtures with 31 salts tested, figures for tests with sugar solutions containing NaCl, Na acetate and K acetate are given.

* * *

Determination of small quantities of reducing sugars. J. ZAJÍC. *Sborník Vysoká Skoly Chem.-Technol. v Praze; Oddíl Potravinarské Technologie*, 1957, 275–282; through *Chem. Abstr.*, 1959, **53**, 2655.—The determination of small amounts of reducing sugars by means of paper chromatography is carried out with the solvent butanol-acetic acid-water (4 : 1 : 5) developing by means of $AgNO_3$ in acetone and 0·25*N* KOH in ethanol, igniting the spots, dissolving the ash in HNO_3, and determining the Ag photocolorimetrically in the form of colloidal Ag_2S.

* * *

The time of inversion of sucrose solutions in a boiling water bath and its effect on sugar analysis. W. SCHOCH and M. ROULET. *Mitt. Geb. Lebensm.-unters. Hyg.* 1958, **49**, 423–433; through *S.I.A.*, 1959, **21**, Abs. 562.—Inversion of sucrose at pH 1–2 on a boiling water bath appears to be complete within 5 min, but the standard deviation of repeated determinations was ± 2·72%, probably owing to such uncertainties as the thickness of glass vessels, etc. A standard time of 10 min is therefore suggested. Further tests showed that 30 minutes' heating did not alter the results. Analyses by Potterat and Eschmann's complexometric method gave slightly low results (99·6% ± 0·390%); the Swiss Customs method gave slightly high results. Potterat and Eschmann's method, after inversion for 10 min at pH 1–2, is preferred. With 30 minutes' heating, both lactose and maltose are to some extent degraded, so that their reducing power is increased and somewhat high contents are found on analysis (101·3 or 101·9% respectively). If hydrolysis is restricted to 10 minutes, the effect is only very slight (100·3 or 100·6%). The proposed method is therefore suitable when mixtures are analysed. The reproducibility of results is shown to be very good.

* * *

Separation of sucrose, glucose, fructose, and sorbitol by paper chromatoelectrorheophoresis. S. GERLAXHE and J. CASIMIR. *Bull. Inst. Agron. Stat. Recherches Gembloux*, 1957, **25**, 265–268; through *S.I.A.*, 1959, **21**, Abs. 563.—The sugars are separated by paper chromatography, with 1 : 5 : 3 : 3 benzene-butanol-pyridine-water mixture as solvent, on a strip of paper 0·5 to 1 cm wide, on which an alcoholic solution of sodium taurocholate (0·5%) and orthophosphoric acid (10%) has previously been evaporated. The strip is then placed on one side of another piece of filter paper (Whatman No. 1) for electrophoresis at right angles to the chromatographic separation; the evaporation of the buffer on the paper ensures good adherence of the strip. The buffer solution contains 0·2 *M* boric acid, 0·05 *M* NaCl and 0·05 *M* borax, for pH 7 to 7.5. Benzidine spraying reagent is used to detect the sugars, and a slightly alkaline solution of $NaIO_4$ and $KMnO_4$ to detect the sorbitol.

* * *

Studies on the formation of molasses. II. Determination of specific and molecular rotations of sugar-salt complexes. N. A. RAMAIAH and –. VISHNU. *Sharkara*, 1959, **2**, 56–62.—Various salts were added to solutions of sucrose and levulose and the rotation measured for every concentration of each salt. These gave series of graphs indicating the effect of salts on sucrose and levulose polarization, and from which the molecular and specific rotations of sugar-salt compounds are calculated and tabulated.

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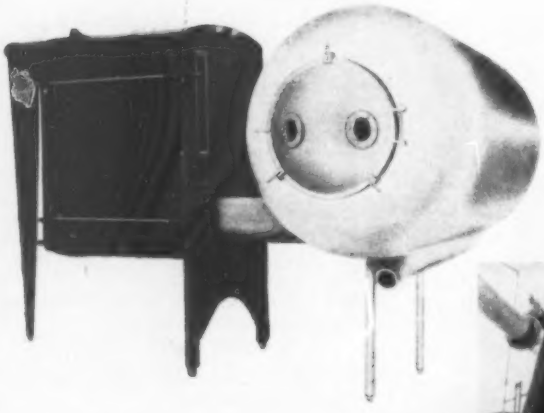

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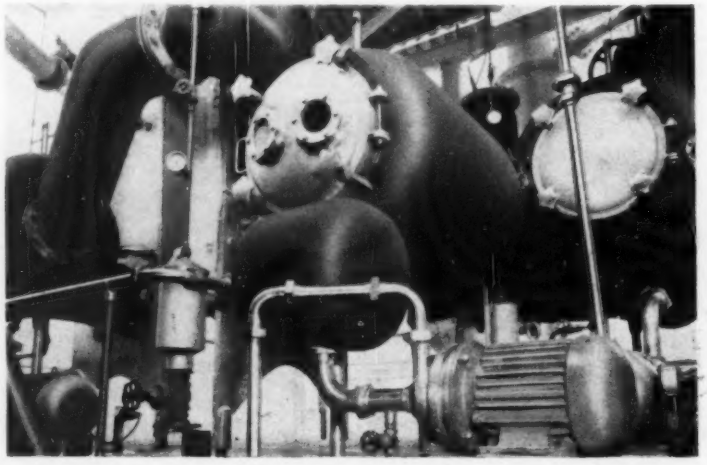

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BY-PRODUCTS

Utilization of sucrose. II. Manufacture of levulose from sucrose. P. T. HSIEH, C. C. WU and T. S. SHIH. *J. Formosan Sci.*, 1958, **12,** 155–160; through *S.I.A.*, 1959, **21,** Abs. 382.—The optimum conditions for formation of calcium fructosate were found to be the addition of 1·5 times the theoretical amount of lime to a 10° Brix solution of invert sugar at 5–10°C. The reaction was then complete in a few minutes, and gave a yield of 85% on theory. The glucose in the crude calcium fructosate precipitate was reduced to 1% by washing with cold distilled water or by reprecipitating the fructosate. On diluting one part of calcium fructosate with five parts of water and saturating with CO_2 to pH 8·5–9·0, filtering and evaporating, a clear transparent syrup was obtained. The addition of 0·1% of H_3PO_4 to the filtrate before the carbonatation enabled the time required for saturation to be halved.

* * *

Molasses. L. GULMINELLI. *Ind. Sacc. Ital.*, 1959, **52,** 229–230.—Molasses production in Italy is high as a result of low beet purities. A table is given showing the amounts used for sugar recovery and yeast, fodder, and alcohol production. It is expected that the last of these will decrease proportionately because of competition from the wine industry, but the others will increase, particularly the first, through development of ion exchange techniques as well as the barium saccharate and Steffen's processes.

* * *

The rôle of protein in the feeding of domestic animals. S. ERIKSSON. *Socker Handl.* II, 1959, **15,** 11–14.—The need for protein, its quality and transformation of nitrogen compounds in animals are described. The supply of protein to domestic animals is discussed, and it is pointed out that while molasses of 77% solids may contain 12·1% crude protein, only 2·5% will be true protein, the difference being amino-acids, peptides, amides, ammonium salts and nitrates, the value of which is problematical.

* * *

Sugar cane bagasse-blackstrap molasses rations with and without hormones or antibiotics. P. B. BROWN, R. A. DAMMON, T. E. D'ESCRIVAN, C. B. SINGLETARY and G. L. ROBERTSON. *Sugar J.* (La.), 1959, **22,** (4), 13–14, 17, 19.—In cattle-feeding trials bagasse-molasses mixtures made up 70% of the ration, the remainder being feeds to supply protein, energy, vitamins and minerals. The best proportions were found to be 20% bagasse and 50% molasses, which gave a satisfactory winter feed for beef cattle. Addition of 10 mg/day of diethylstilbestrol and/or 75 mg/day chlortetracycline to the feed was found to give inconclusive results as to better utilization, while chlortetracycline on its own gave reduced feed intake and efficiency.

* * *

Grades, definitions and feeding value of blackstrap molasses. S. L. CROCHET. *Sugar J.* (La.), 1959, **22,** (4), 32–36.—Definitions are presented for three types of cane molasses—blackstrap, cane feeding, high-test—as well as mentions of beet and citrus molasses and hydrol (a corn sugar by-product). The use of a minimum Brix is recommended as the only practical and necessary control criterion. The feeding value of blackstrap molasses is discussed, and an account is given of feeding practices developed during the past 16 years by U.S. Sugar Corp., of Clewiston, Florida.

* * *

Determination of optimal conditions for molasses purification with clarifying (centrifugal) separators. A. M. MALKOV, F. S. KRETININ and A. B. KAMINSKAYA. *Trudy Leningrad. Tekhnol. Inst. Pischevoi Prom.*, 1958, **14,** 107–118.—Tests were made on molasses purification for yeast propagation. Acidified and "unaltered" molasses was centrifuged after an optimal dilution with 2–3 volumes of water. Precipitation increased with dilution and with a drop in pH, independent of density or viscosity. The precipitate from the "unaltered" molasses consisted of almost equal parts of organic and inorganic substances, whereas the inorganic substances in the precipitate from the acidified molasses was almost double the organic. Maximum precipitation from acidified and diluted molasses was at pH 3·2 and 15–20°C; there was no improved effect on centrifuging at 34–41°C molasses of pH 7·2–6·5 heated to 90°C and diluted with two volumes of water. Viscosity fell with pH, independent of dilution. A drop in colour was caused not only by the indicator properties of the colour bodies, but also by the removal of the colloidal colour bodies when acidified. Large numbers of bacteria are precipitated with the coagulated colloids from diluted, and especially acidified, molasses. Optimal centrifuging temperature was 45°C at which there was little foam formation. Any impurities remaining in the molasses are easily removed by centrifuging and washing the yeast.

* * *

Butanol-acetone fermentation of cane juice. E. VICIEDO PERDOMO. *Inst. Cubano de Investigaciones Tecnól., Serie de Estudios Sobre Trabajos de Investigación*, 1958, (3), 32 pp.; through *S.I.A.*, 1959, **21,** Abs.642.—Yields of up to 32% of mixed solvents (on sucrose) have been obtained by fermentation of cane juice (with addition of nitrogen compounds and activators) with selected varieties of *Clostridium acetobutylicum*. The solvent mixture obtained comprised a high proportion of butanol.

* * *

Cooling tower made of asphalt bagasse board. ANON. *Taiwan Sugar*, 1959, **6,** (7), 23–24.—A smooth-operating cooling tower of satisfactory performance has been constructed from an asphalt-impregnated bagasse board of medium density, which is made by a patent process of Taiwan Sugar Expt. Station and is mechanically strong, water-proof, and insect-resistant. The tower is designed and operated at 3000 g.p.h. throughput and reduces water temperature, from 113° to 88°F.

UNITED KINGDOM

Charging suspended-type centrifugals. SOC. DES RAFFINERIES ET SUCRERIES SAY, of Paris 7e, France. **817,197.** 16th July 1957; 29th July 1959.—Sugar massecuite or magma is drawn from a storage vessel and returned through a conduit over the top of the centrifugal by the action of a volumetric pump delivering at a fixed rate depending on its motor speed. A trap door in the conduit permits the massecuite or magma to drop into the centrifugal basket while a butterfly valve in the conduit is linked to this trapdoor so that the valve closes when the trapdoor opens and vice-versa. The operation of the trap door is governed by a timing control so as to allow charging at a predetermined rate and interval, while a safety device is incorporated so that, should the timing control fail, the trap door closes.

* * *

Recovery of sugar from sugar-containing substances. FRIEDRICH UHDE G.m.b.H., of Dortmund, Germany. **818,341.** 15th August 1955; 12th August 1959.—Sugar is recovered from e.g. dried beet cossettes or molasses by extracting with liquid ammonia and the extract mixed with one or more organic solvents (a mono- or dihydric alcohol or ketone containing up to 5 carbon atoms, e.g. methanol, or formamide, mono- or dimethyl-formamide or a mixture of two or more of these, if desired, in admixture with one or more hydrocarbons, e.g. benzene or toluene, or ethers, e.g. tetrahydrofuran, or mixtures of these). If desired, a small amount of water may be added. Substances of high molecular weight which are precipitated are filtered off, and the sugar recovered by reducing the ammonia content to less than 8% either by addition of more of the same or a different solvent or solvent mixture, or by heating the solution to a temperature between 45°C and the boiling point. Any water added may be removed by adding a solvent which forms an azeotropic mixture with water, followed by partial distillation. To the ammonia-solvent mixture may be added CO_2, SO_2, and/or formaldehyde, to the extent of up to 2% on sugar present, to bind ammonia and to prevent undesirable side-reactions. The ammonia-solvent solution may be treated with active carbon to remove colouring matter before recovery of the sugar.

* * *

Beet topper. MASSEY-HARRIS-FERGUSON (SALES) LTD., of Coventry, Warwickshire. **818,481.** 7th November 1955; 19th August 1959.

* * *

Beet diffuser. BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT, of Braunschweig, Germany. **822,223.** 17th March 1958; 21st October 1959.—In a tower diffuser of the usual pattern a cossette-juice mixture is pumped into the tower 1 by pump 12, carried up by the blades 3 attached to the hollow shaft 2 and discharged through pipe 21 by worm conveyor 20. Juice withdrawal, however, instead of being through screens which are easily blocked and difficult to clean, is by way of the four radial bores 15 feeding the axial bore 16 of hub 5 into which the hollow shaft 2 is located by the spigot 19. The end of the bores 15 are underneath distributor blades 7 attached to the hub 5

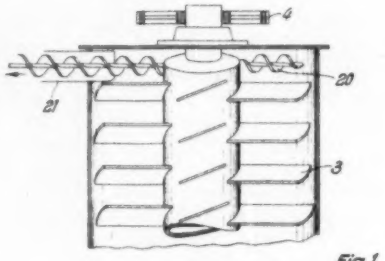
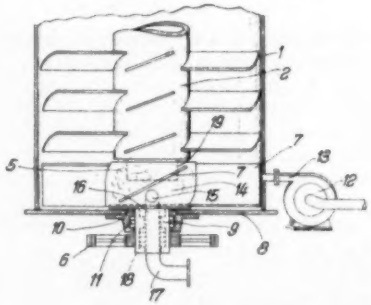


Fig. 1



which is driven by suitable means through gear 6. It has been found in practice that, apparently because of the flow characteristics and the relative densities of the juice and cossettes, hardly any cossettes or pulp are found under these blades so that juice may be withdrawn and any material contained in it may be removed in a pulp catcher. The hub moves inside the hollow bearing 9 in flange 10 and sealed by stuffing box 11. The fixed pipe 17 for juice withdrawal is mounted inside axial bore 16, also with stuffing boxes 18 to prevent leakage.

* * *

Preparing carboxylic acid esters of sucrose or raffinose. SUGAR RESEARCH FOUNDATION INC., of New York 5, N.Y., U.S.A. **824,654.** 2nd January 1956; 2nd December 1959.—Cf. U.S.P. 2,893,990[1].

[1] *I.S.J.*, 1959, **61**, 381.

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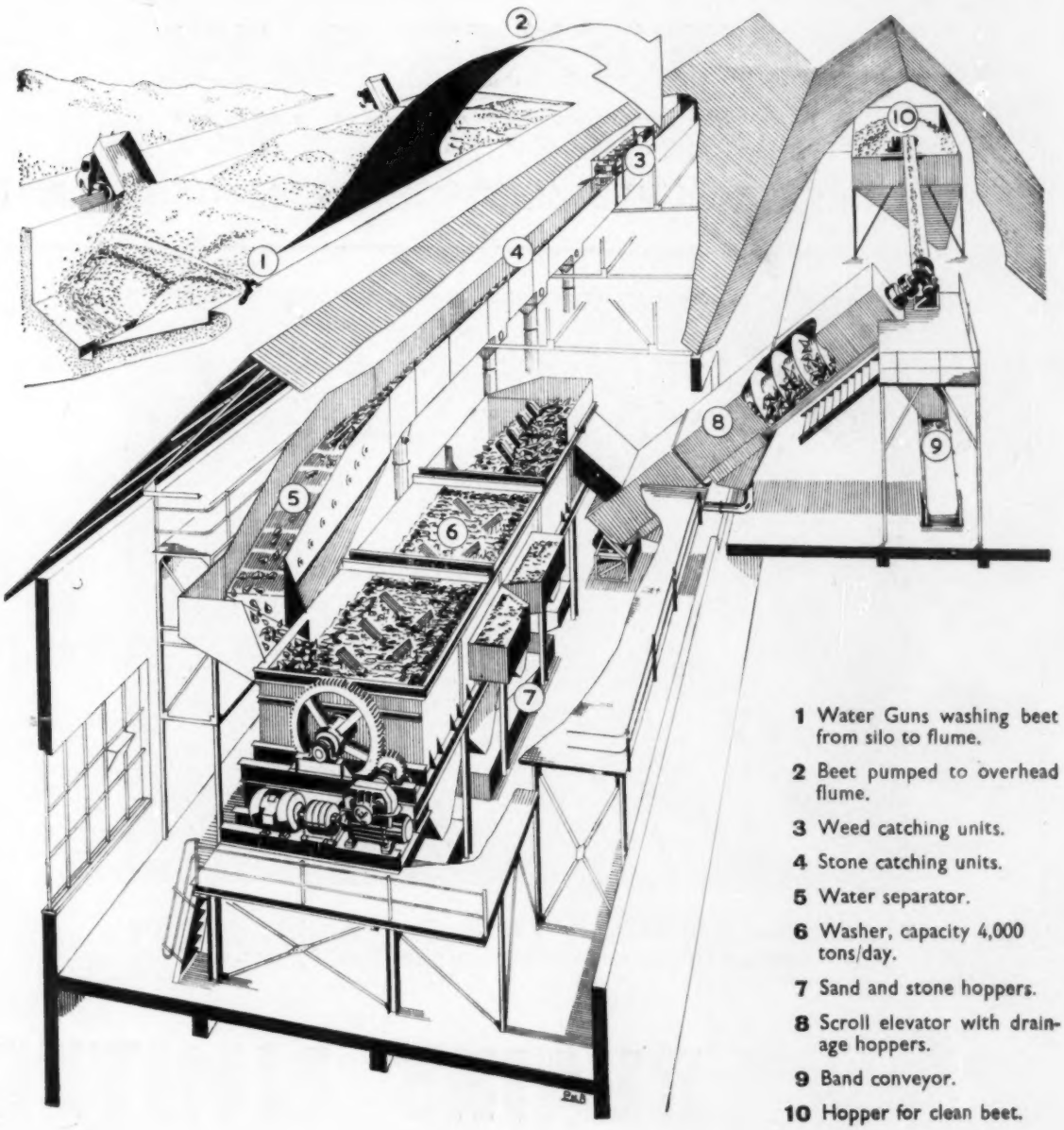

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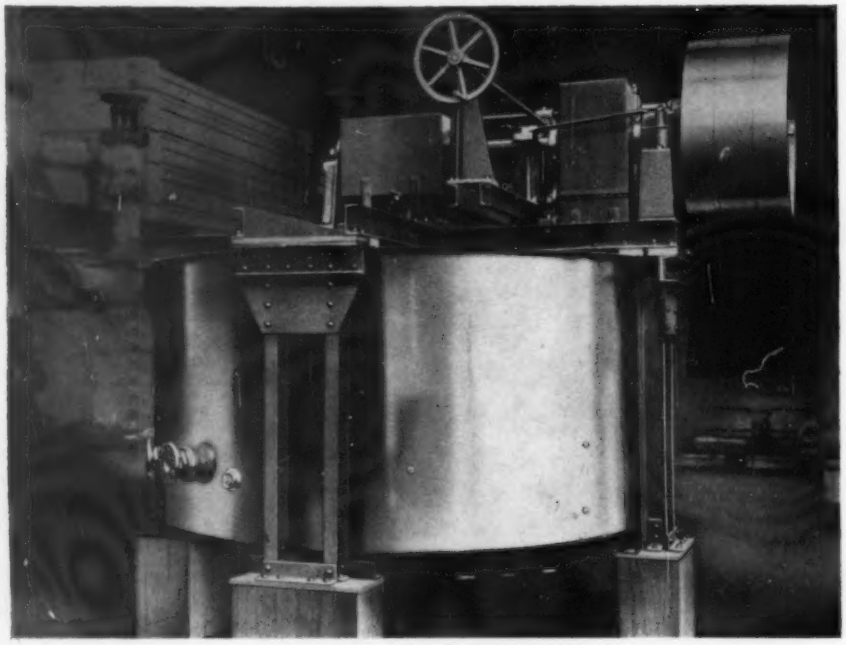

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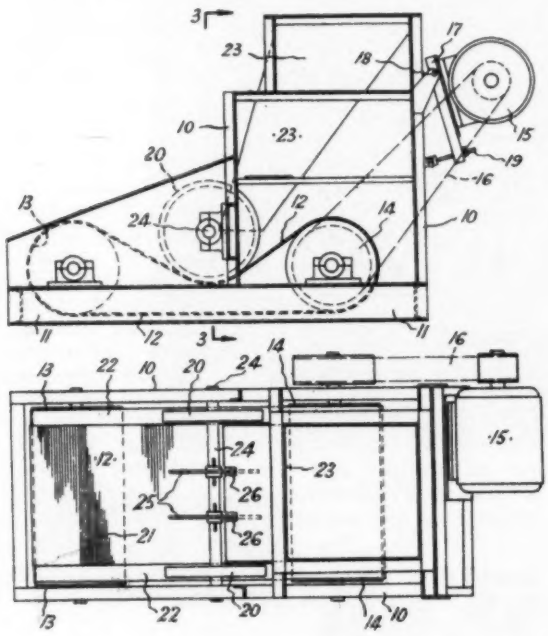
Appliance for throwing sugar. S. W. LUCAS, of Brisbane, Queensland, Australia. **825,113.** 15th April 1958; 9th December 1959.—Sugar delivered through chute 23 falls onto the endless belt 12 and is thrown off, e.g. into a ship's hold, by virtue of the movement of the belt driven by the rear roller or pulley 14, itself belt- or chain-driven by motor 15. Shaft 24 carries pulleys 20 at its ends to provide the



necessary shape to the belt to give the desired trajectory, and to prevent lateral bulging of the belt at high speeds or when running idle, with consequent displacement from the periphery of pulleys 20, the shaft carries a number of discs 25 of somewhat smaller diameter than pulleys 20 and located by longitudinal slots or key in shaft 24. Slots 26 are also cut in chute 23 to accommodate the discs.

* * *

(Automatic feed for) Continuously fed centrifugals. ESCHER WYSS A.G., of Zurich, Switzerland. **826,034.** 12th July 1956; 23rd December 1959.—Cf. U.S.P. 2,868,381[1].

* * *

Molasses treatment. INTERNATIONAL MINERALS & CHEMICAL CORP., of Chicago, Ill., U.S.A. **826,164.** 11th October 1956; 31st December 1959.—Beet molasses, as a 40–70°Bx solution, is treated, to the extent of at least 60% (65–85%) by weight of sugar it contains with "barium oxide compound" [BaO or $Ba(OH)_2$, weights of the latter being expressed in terms of BaO equivalent], at a temperature of 50–85°C for 5–½ hr (depending on the temperature), whereby the sugar is precipitated as barium saccharate and the glutamic acid precursors are hydrolysed. The barium saccharate precipitate is separated and washed with dilute aqueous BaO, 80–100% of the washings being returned for treatment of further molasses. The barium saccharate mother liquor is treated with 0·4–3% of an alkali metal hydroxide and CO_2 passed in until the pH reaches 8–10, so precipitating all the Ba as barium carbonate. This precipitate is separated and the mother liquor treated to recover the glutamic acid or acidified to pH 7 and concentrated to 50% solids whereupon the glutamic acid remains stable during storage.

* * *

Recovery of sucrose esters. DISTILLERS CO. LTD., of Edinburgh, Scotland. **826,801.** 29th July 1958; 20th January 1960.—Esters of sucrose with aliphatic monocarboxylic acids (caprylic, lauric, stearic, palmitic, linoleic, linolenic or oleic acid) are recovered from crude reaction mixtures by removing at least 90% of the solvent and treating the residue at pH 7 with water and a ketone solvent (a lower aliphatic or cyclo-aliphatic ketone of not more than 8 carbon atoms, e.g. methyl *iso*-butyl ketone) or an ester solvent (amyl, butyl or *iso*-butyl acetate) at a temperature of 40–80°C, whereupon the sucrose ester enters the solvent phase; this is separated from the aqueous phase, washed with water, and the sucrose ester recovered. The process may be operated as a continuous counter-current extraction.

* * *

Drying molasses. GEORGE SCOTT & SON (LONDON) LTD., W. H. FOSH and H. A. S. SANDERS. **826,949.** 17th October 1957; 27th January 1960.—The molasses is concentrated to about 88% solids in an evaporator or series of evaporators under closely controlled conditions of temperature and reduced pressure, and the product flash-dried by injecting through nozzles into a vacuum dryer having an absolute pressure of no greater than 10 mm mercury, at such a temperature that the concentrate assumes a dry or substantially dry state immediately. It is granulated or ground in the vacuum to prevent caking.

* * *

Hardboard or plastic board. J. D. MORGAN, comm. by L. F. WIGGINS and R. F. TEMPLE, of Trinidad, W.I. **827,196.** 23rd July 1957; 3rd February 1960.—A hardboard or plastic board is produced by heating (e.g. at 150°C) ammoniated bagasse under pressure (e.g. up to 2000 p.s.i.) with a synthetic resin (partially polymerized phenol-formaldehyde resin) and a plasticizer (butyl stearate).

* * *

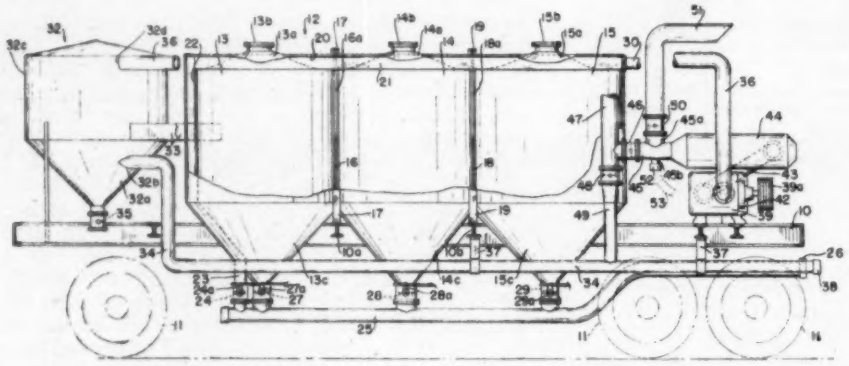
Carbamide esters of sucrose. FARBENFABRIKEN BAYER A.G., of Leverkusen Bayerwerk, Germany. **827,358.** 23rd July 1958; 3rd February 1960.—Esters, suitable as washing or antifoam agents, having free hydroxyl groups on the sugar residues, are produced by reacting a sugar—sucrose, maltose, lactose, or raffinose (sucrose)—with an alkyl isocyanate having more than 8 carbon atoms in the alkyl radical (stearyl isocyanate) in an inert solvent (dimethyl formamide) at an elevated temperature.

[1] *I.S.J.*, 1959, **61**, 154.

UNITED STATES

Apparatus for transporting loose material (sugar) in bulk. L. G. WELLER, assr. FULLER COMPANY, of Catasauqua, Pa., U.S.A. **2,901,133.** 30th July 1957; 25th August 1959.

The trailer illustrated is provided with a frame 10 and wheels indicated at 11. It carries a tank comprising three vertical intersecting cylindrical compartments 13, 14, 15 with sealable inlet hatches and conical bottoms. An inverted channel 20, bisected



by baffle 21 extends along and passing through the conical tops of the compartments. The channel is open to the interior of the compartments and at one end is connected to a pipe 30 with the join on one side of the baffle while at the other end the channel connects with a downward duct 22 leading to an outlet pipe 23 and a discharge conduit 25 by way of valve 24. The conduit runs the length of the trailer and is provided with a removable cap 26. The compartments are also provided with discharge ports into conduit pipe 25 by way of valves 27, 28 and 29.

A dust collector 32 of conventional type is mounted on the trailer frame and has a pipe 34 (fitted with a removable cap 38) leading into its conical bottom section, while a pipe 36 comes from the gas outlet and leads to the inlet of motor-driven blower 39. The outler of the blower is connected by pipe 43 to a muffler 44. From the outlet of the muffler pipe 45 connects with a pipe 47 by way of valve 46, and pipe 47 is connected at one end to pipe 34 by way of valve 48 and to the channel 20 on the other side of the baffle from pipe 30. Pipe 45 is connected to atmosphere through valve 50 and a second branch 45b terminates in a coupling with a cap 52 for connexion to a hose 53.

When the vehicle is to be loaded pneumatically, the pipe 30 is coupled to a source of supply, valve 46 is opened and valves 48 and 50 are closed. When the blower is started a steam of air carrying sugar is drawn from pipe 30 into one side of channel 20 from which it falls into the compartment 15 as the air velocity falls. The air passes under baffle 21 and out of channel 20 into pipe 47; into pipe 34, through the dust collector 32 and thence to the blower 39 whence it discharges to atmosphere through the muffler 44 and pipe 51. If the sugar is being loaded from a bin, air can be supplied to this by coupling an air hose from branch line 45b, the valve 50 being partly closed. No dust passes into the atmosphere to create a nuisance.

When the sugar is to be unloaded, valve 46 is closed and valves 48 and 50 are opened. The cap 26 is removed from pipe 25 and this connected to the storage bin by a suitable hose. The cap 38 is removed from pipe 34 and this preferably connected to the interior of the receiving bin. When the blower is started, air from the receiving bin is drawn through the dust collector 32 and passes into the blower inlet. From the blower outlet it passes through the muffler 44, pipes 45 and 47 into channel 20 and duct 22 into pipe 25. As valves 27, 28 and 29 are opened sugar is entrained in the airstream and carried to the receiving bin. By adjustment of valve 24 a positive pressure in the compartments relative to that in the pipe 25 can be obtained and thus unloading is assisted. Continuous withdrawal of air from the receiving bin prevents any dust nuisance during unloading.

* * *

Beet harvester. W. W. STOLL and E. R. REUTER, of Peine, Germany. **2,906,350.** 21st December 1955; 29th September 1959.

* * *

Production of dextran. E. J. HEHRE, H. M. TSUCHIYA, N. N. HELLMAN and F. R. SENTI, assrs. U. S. SECRETARY OF AGRICULTURE. **2,906,669.** 30th October 1956; 29th September 1959.—Dextran of intermediate molecular weight is produced by cultivating *Streptococcus sp.* NRRL B-1351 in aqueous medium comprising 10–20% sucrose and a source of assimilable nitrogen (e.g. yeast extract or corn steep liquor solids), at an initial pH of 6–8 until a substantial part of the sucrose has been converted to dextran (2–14 days) and dextran recovered from the culture medium.

* * *

Production of citric acid. J. H. FRIED and J. G. SANDZAM assrs. STAUFFER CHEMICAL CO. **2,910,409.** 14th December 1956; 27th October 1959.—A mash containing blackstrap molasses is adjusted to pH 4·3–6·2 (4·8–5·4; 5·6–6·2; 4·3–5·0), inoculated with a citric acid-producing organism and allowed to ferment until the mycelium volume is 0·5–5·0% of the total mash volume. An acid or acid salt is added to reduce the pH by at least 0·1 unit to a pH of no lower than 3·3 (3·8; 4·6; 3·3), so as to encourage citric acid production, thereafter permitting fermentation at the lower pH.

Evaporators at the British Sugar Corporation Beet Sugar Factory at Cupar fitted with H & W 70/30 Brass Tubes. The evaporators are lagged with plastic lagging. (Photograph by courtesy of the British Sugar Corporation Limited).

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Fully continuous flow centrifugals of Hein, Lehmann & Co. A.G. are excellently suitable for curing of most difficult massecuites, e.g. C-, final or second product.

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The fully continuous sugar centrifugal has been perfected after years of research and development by Hein, Lehmann & Co. A.G. These centrifugals, working on the thin-layer principle, have already been copied in spite of application for patent protection. They have been successfully introduced not only in Germany but also in numerous other countries.

Fully Continuous Flow Centrifugals

offer the following advantages:

- continuous working
- reduction of working personnel
- small current consumption, no current peaks
- high output
- light weight
- no special foundations
- vibration-free running
- uniform sugar quality

HEIN, LEHMANN & CO.

Aktiengesellschaft Duesseldorf

Abt. Massentrennung

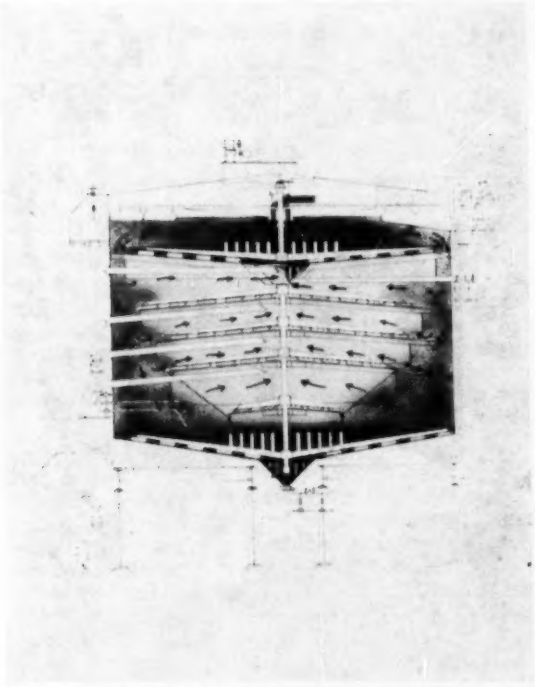
Telephone: 70201 *Telex:* 0858 2740 P.O. Box 4109

TRADE NOTICES

Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

The "Prima-Sep" clarifier. Graver Water Conditioning Co., 216 West 14th Street, New York 11, N.Y., U.S.A.

This improved sugar clarifier has 25 per cent greater capacity than previous designs and is able to clarify high solids and thick juices at high rates. It is designed for use with manual or mechanized processing techniques.



The "Prima-Sep" has a primary separation and mud removal tray at the top in addition to a final mud removal tray and four settling trays. The unit is so designed that up to 60% of incoming impurities settle on the primary tray and are removed from the machine as a thick, dejuiced mud. The juice is thus rendered easier to clarify.

The settling trays in the "Prima-Sep" are progressively shortened to create a large peripheral "free-fall" area where solids are especially susceptible to rapid and complete sedimentation.

Because of the "free-fall" clarification carried on in the "Prima-Sep", the unit is able to treat juice with a high solids content and can remove all types of particles including the finest bagacillo. This means that juice for the unit need not be carefully processed by hand methods. The cane can be harvested and milled by machines which produce a dirtier product. Also, the "Prima-Sep" is not sensitive to the mud and dirt which result from cane harvested during poor weather. In line with the trend to new maceration machines which require less water, the "Prima-Sep" is designed to treat hot thick as well as hot thin juices.

Economies made possible by the improved Graver design include : lower initial cost because of greater capacity ; low filtrate return because of greater mud thickening, leading to smaller vacuum filters; less inversion; minimum cane processing expense because of greater clarifying in the unit; use of economical mechanized processing techniques; lower water, evaporator pan and steam requirements; greater yield of raw sugar; lower overall maintenance and attention.

Among the features of the "Prima-Sep" is a new inlet system with a baffle deflection plate. The plate induces a rolling action in the juice which makes for prolonged and intimate contacts of solid. Another feature, and one in which sugar factories are especially interested, is greater mud thickening. Graver has added vertical pickets to the mud scrapers in the primary and final mud removal trays which, along with separate sump pickets, thicken and dejuice the mud to the maximum.

Like the Graver Clarifier which it succeeds, the "Prima-Sep" is designed specifically for liquid-solids separation in the sugar industry and does not derive from applications in any other field.

* * *

Drying finely powdered materials. Dunford & Elliott Process Engineering Ltd., Linford St., London S.W.8.

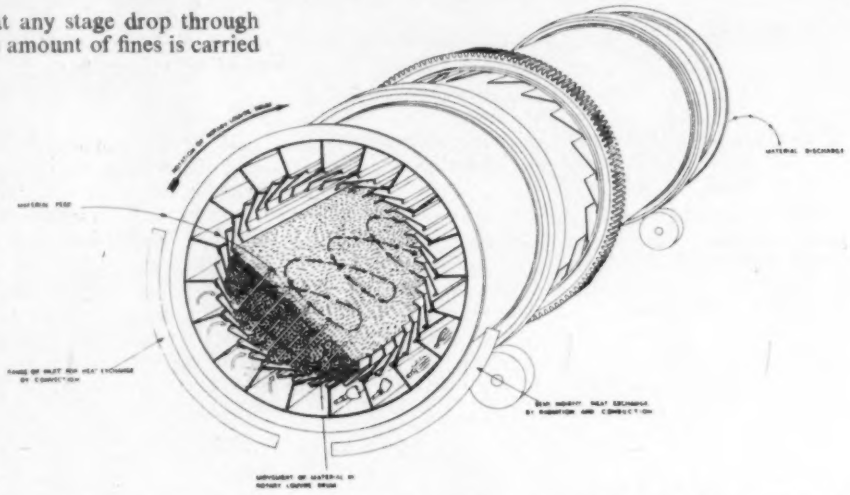
The usual rotary louvre dryer and cooler consists of a rotating horizontal drum with a series of internal radial plates on which the material being processed lies. A current of warm or cold air which is admitted through a series of tangential louvres passes through the bed of materal while this is slowly turning over and is travelling to the discharge outlet.

A new system of operation prevents the carrying away of fine materials by eliminating the current of air and effecting the heat transfer by heating or cooling sections of the internal louvres before they enter the bed of the material. When heating, a flame, or alternatively hot air, is applied directly to a number of louvres which in turn rapidly transfer their heat to the material. When cooling, sections of the louvres cooled by air extract the heat from the hot material.

This system of heat exchange by conduction can be supplemented by a small volume of hot or cold air passing through the material bed at a velocity to suit the fineness of the material being processed and

as the material does not at any stage drop through the air current, a negligible amount of fines is carried away, it is reported.

This semi-indirect system can also be applied during normal rotary louvre operation to the processing of materials in the form of large crystals in order to obtain an additional heating or cooling effect by pre-heating or pre-cooling the louvres before they enter the bed of the material.



In a comparison made between this method and the conventional rotary louvre system of operation during the cooling of sugar from a temperature of 44°C, a discharge temperature of 20°C with an increased throughput of sugar was obtained with the new system as against 27°C with the conventional method, the increase in cooling efficiency being over 41%.

* * *

"Deminrolit" portable deionizing plants. The Permutit Company, Ltd., Gunnersbury Ave., London W.4.

Small de-ionizing equipments are superseding the still and distilled water delivered in carboys as a source of purified water for laboratories and test houses. A feature of many such equipments, however, is their reliance on detachable cartridges containing ion exchange resins which are returned to the supplier when exhausted.

The Mark 4 and 5 portable "Deminrolit" plants have been designed for easy "on the spot" regeneration thus obviating the need for detachable cartridges and replacements. Since regeneration requires small amounts only of inexpensive chemicals, running costs are reduced to a fraction of the expense involved in distillation or the purchase of purified water from wholesale suppliers.

Both plants consist of a pair of sealed columns charged respectively with "Zeo-Karb" cation and "De-Acidite" anion exchange resins, tap water being passed through the columns in that order. Flexible connexion and delivery tubes, with a multi-valve control system, facilitate operation and regeneration. A built-in dial type conductivity tester enables "spot" checks to be made on the quality of water being produced. By this means the point at which regeneration becomes due may be easily determined.

Regeneration involves flushing the cation exchanger column with a dilute solution of hydrochloric acid and the anion exchange column with dilute caustic soda or soda ash solution. Both columns are then rinsed with water when the plant is ready for further use.

Either plant is available as Type "E" or Type "F", the difference being in the type of resin used in the "De-Acidite" column. The former produces a water comparable to commercial distillate while the latter produces a water of much higher purity.

Output between regenerations depends on the quality of the mains supply and will vary, therefore, from one locality to another. The rate of flow, however, is unaffected by the raw water quality, the Mark 4 producing de-ionised water at about 11 gallons hourly and the Mark 5 at about 6 gallons hourly.

One air mail stamp

can get you valuable help when you need it!

Just one letter to SUCHAR is all that's required to get a prompt answer to any question you have on cane sugar refining!

Our reply will be based on our 40 years' experience *plus* the combined, up-to-the-minute experience of refiners the world-over.

Suchar engineers visit most cane sugar areas during each crop season to keep current our first-hand knowledge of world conditions. In addition we solicit daily and cumulative run reports from refiners everywhere which we correlate and evaluate for the benefit of our customers.

Thus, we are in a unique position to supply authoritative information and needed technical assistance with any refining problem . . . at no cost to you. That's another good reason to rely on SUCHAR for your carbon and filtration equipment needs.

Suchar
ACTIVATED CARBON

Developed specifically to meet the decolorizing and filtration requirements of the cane sugar industry, its amazing surface area and porosity make SUCHAR Activated Carbon the most efficient carbon you can use. It's the simplest, most economical way to remove objectionable colors, odors and flavors from sugar liquors. Let us quote on your requirements.

*Reg. T. M. of FAS-FLO FILTER CORPORATION, New York

FAS-FLO* FILTERS

An improved horizontal-leaf pressure filter with many unique advantages. This filter is setting records for stepped-up production and increased recovery in cane sugar areas throughout the world. Easier and more economical to operate, too. Write for literature.

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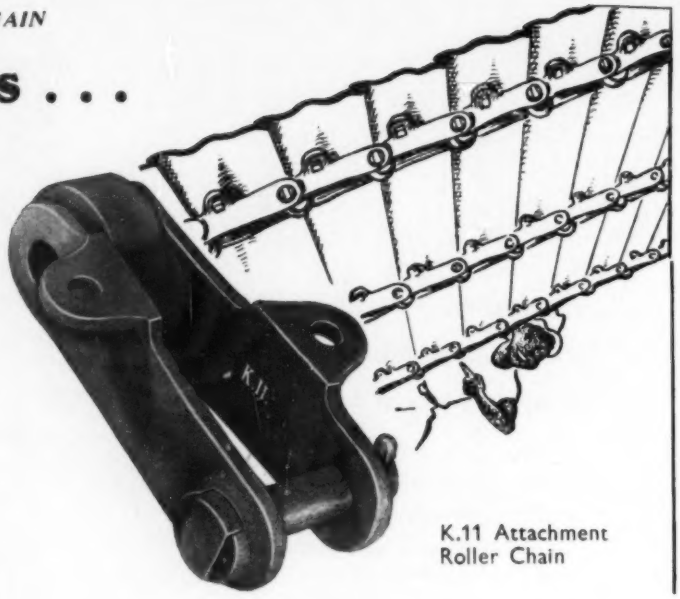
THRO' THE MILL—ON PENNINE CHAIN

Under the slats . . .

Pennine Roller Chains with K.11 Attachments are made to run through many gruelling seasons of cane carrier service.

Correctly assembled telescopic bosses and hard-wearing rollers ensure true and free-running Chains for this work. Secure attachment of slats is made to the staggered side bars on each Link. Other Attachments to suit individual needs are also available with this type of Roller Chain.



K.11 Attachment Roller Chain

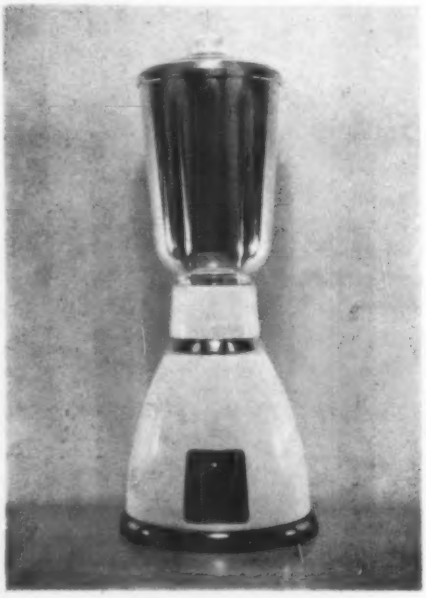
Sugar production runs smoother on

Pennine chain

TOUGH MALLEABLE IRON—LONG WEARING
INTERCHANGEABLE WITH OTHER MAKES

Catalogues on request: PENNINE CHAINBELT CO. LTD., ARMLEY, LEEDS 12, ENGLAND

A Suma Product



BAGASSE ANALYSIS

This new model high-speed mixer has knives of improved design and special feeder-type lid to prevent spillage. Two speeds, up to 14,000 r.p.m., single-phase voltages only. Metal goblet capacity 2000 ml.

The
Sugar Manufacturers' Supply Co. Ltd.
7 & 8, IDOL LANE, LONDON, E.C.3
(*Cable Address* : Sumasuco-London)

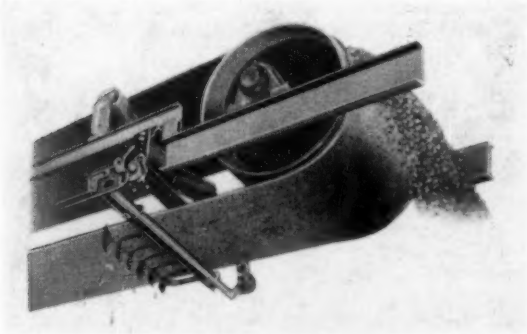
The Mark 4 plant is mounted in an upright, tubular framework on a small, rubber-tyred, two-wheeled undercarriage which enables the plant to be transported easily from one department to another. The smaller Mark 5 plant is equipped with carrying handle and is designed for bench-top operation.

Both plants are constructed throughout from non-corrodible materials and operate at normal cold water tap temperatures and pressures.

* * *

Spring type belt cleaner. Stephens-Adamson Mfg. Co., Ridgeway Ave., Aurora, Ill., U.S.A.

The efficiency, dependability and economy of the S-A Spring Type Belt Cleaner has been proved in hundreds of widely diversified installation applications. It consists of a row of thin, spring steel wiper blades, each with an individual pressure spring. The wiper blades are set perpendicular to the belt surface, but diagonal to travel of belt. Pivoted connexions between blades and springs permit the wiping edges of blades to seat uniformly on the surface of the returning belt. As the belt passes over the cleaner, each blade wipes a path clean and dry, and, as the blades overlap, the entire carrying surface is wiped clean and free from dirt.



The belt-cleaner gently removes material which adheres to the returning belt and would otherwise be ground into the belt by snub pulleys and return rollers. This action eliminates accumulation of material on return rollers and caking build-up on snub pulleys which could cause dangerous belt stresses. In this way, the belt-cleaner increases belt life by eliminating abrasive action of a dirty belt passing over snub pulleys and return rollers.

Blade pressures on the belt are low, so belt wear is negligible. No moving parts and no power drive are required, making the S-A spring belt cleaner easy to install and economical to operate. The belt-cleaner is available for any width belt.

* * *

PUBLICATIONS RECEIVED

FOR GREATER SAFETY. Nu-Swift Ltd., Elland, Yorks.

A comprehensive catalogue describes the types of fire risk and the Nu-Swift equipment for combating them.

KENT INSTRUMENTS FOR TEMPERATURE MEASUREMENT. George Kent Ltd., Luton, Beds.

In Publication 265 appear descriptions of the principles of operation and general features of the Kent temperature indicators, recorders and controllers, with more detailed descriptions of the individual instruments—self-balancing and manually-balanced—together with specifications and dimensions and mounting particulars.

* * *

CROFTS ELECTRICALLY RELEASED MAGNETIC BRAKES, TYPE B. Crofts (Engineers) Ltd., Thornbury, Bradford 3, Yorkshire.

The Type B brake consists of a stationary housing which accommodates a magnetic coil, a series of alternate steel and friction discs and a hub for the shaft arrested by the brake. Internal teeth in the friction discs mate with teeth cut in the hub while peripheral teeth in the steel discs engage with the stationary housing. In operation the brake remains normally engaged due to pressure on the discs exerted by a number of compression springs acting against a pressure plate. When the current is switched on the pressure plate is attracted against the spring loading thus relieving the plates so that the hub is free to rotate. Details of the models available are given in Publication 5917.

* * *

KENYON MOTOR BASES. William Kenyon & Sons Ltd., Dukenfield, Cheshire.

The "Ampulco" motor bases described in booklet 59/4PT have been devised to replace slide rails so that belt adjustment may be made to fine limits without stopping the motor, and by means of a single screw adjuster. It is possible to arrange automatic adjustment by measurement of the reaction torque on a motor amounted on an "Econ-o-matic" base which is free to move through a limited arc varying the centre distance to maintain the required belt tension.

* * *

LUMP SUGAR PLANTS. Maschinenfabrik Buckau R. Wolf A.G., Grevenbroich-Neuss, Germany.

Buckau Wolf supply semi-automatic equipment for the production of sugar cubes and tablets which can produce between 588 and 1377 kg/hour of lumps, depending on the dimensions, and is described in Leaflet F 1271. Fully automatic equipment can also be supplied to special order.

* * *

Sugar transport in the U.K.—A recent order has been placed for twelve Guy Warrior vehicles as illustrated for delivery of sugar from Tate & Lyle Ltd. to their retailers. The new order brings the total Guy fleet owned by Tate & Lyle Ltd. to thirty.

SUGAR CROPS OF THE WORLD

WILLETT & GRAY'S CROP ESTIMATES†

(1) CANE SUGAR

	Harvesting Period	LONG TONS 1959/60	LONG TONS 1958/59	SHORT TONS 1959/60	SHORT TONS 1958/59	METRIC TONS 1959/60	METRIC TONS 1958/59
U.S.—Louisiana	Oct.–Jan.	393,396	395,410	440,603	442,859	399,710	401,756
Florida	Oct.–Apr.	135,000	120,500	151,200	134,960	137,167	122,434
Puerto Rico	Jan.–June	1,100,000	961,899	1,232,000	1,077,329	1,117,655	977,337
Hawaiian Islands	Jan.–Dec.	890,000	870,207	996,800	974,630	904,285	884,174
Virgin Islands	Jan.–June	11,000	10,800	12,320	12,096	11,177	10,973
Cuba	Jan.–June	5,500,000	5,869,188	6,160,000	6,573,490	5,588,274	5,963,388
British West Indies—Trinidad	Jan.–June	185,000	181,131	207,200	202,867	187,969	184,038
Barbados	Jan.–June	185,000	184,152	207,200	206,250	187,969	187,108
Jamaica	Jan.–June	401,500	379,675	449,680	425,236	407,944	385,770
Antigua	Jan.–June	29,000	28,695	32,480	32,138	29,465	29,153
St. Kitts	Feb.–Aug.	47,000	46,441	52,640	52,014	47,754	47,186
Other B.W.I.	Jan.–June	12,000	11,053	13,440	12,379	12,193	11,230
French West Indies—							
Martinique	Jan.–July	95,000	76,000	106,400	85,120	96,525	77,220
Guadeloupe	Jan.–July	127,000	141,500	142,240	158,480	129,038	143,772
Dominican Republic	Jan.–July	902,704	910,000	1,011,029	1,019,200	917,192	924,606
Haiti	Dec.–June	55,000	53,000	61,600	59,360	55,883	53,851
Mexico	Dec.–June	1,375,000	1,102,700	1,540,000	1,235,024	1,397,069	1,120,398
Central America—Guatemala	Jan.–June	67,500	65,000	75,600	72,800	68,583	66,044
Salvador	Nov.–Mar.	50,000	50,000	56,000	56,000	50,803	50,803
Other Central America	Jan.–June	230,000	205,000	257,600	229,600	233,692	208.290
South America—							
British Guiana	Oct.–June	300,000	285,000	336,000	319,200	304,815	289,574
Colombia	Oct.–June	265,000	250,000	296,800	280,000	269,253	254,013
Venezuela	Oct.–June	170,000	165,000	190,400	184,800	172,729	167,648
Ecuador	June–Jan.	100,000	99,500	112,000	111,440	101,605	101,097
Peru	Jan.–Dec.	750,000	735,000	840,000	823,200	762,038	746,797
Argentina	June–Oct.	850,000	998,000	952,000	1,117,760	863,642	1,014,018
Brazil	June–May	3,150,000	2,830,000	3,528,000	3,169,600	3,200,558	2,875,422
Other South America	Jan.–Dec.	150,000	138,000	168,000	154,560	152,408	140,215
TOTAL AMERICA		17,526,100	17,162,851	19,629,232	19,222,392	17,807,395	17,438,315
India & Pakistan (Gur)	Dec.–May	3,500,000	3,600,000	3,920,000	4,032,000	3,556,175	3,657,780
do. (White)	Oct.–July	2,475,000	2,390,000	2,772,000	2,676,800	2,514,724	2,428,360
Indonesia	May–Nov.	695,000	750,000	778,400	840,000	706,155	762,038
Japan	Oct.–Mar.	121,400	118,885	135,968	133,151	123,349	120,793
Taiwan (Formosa)	Oct.–May	1,000,000	950,000	1,120,000	1,064,000	1,016,050	965,248
Philippine Islands	Sep.–Aug.	1,389,987	1,359,201	1,556,785	1,522,305	1,412,295	1,381,016
TOTAL ASIA		9,181,387	9,168,086	10,283,153	10,268,256	9,328,748	9,315,235
Australia	June–Nov.	1,240,000	1,411,958	1,388,800	1,581,393	1,259,902	1,434,620
Fiji Islands	June–Nov.	282,000	202,236	315,840	226,504	286,526	205,482
TOTAL AUSTRALIA & POLYNESIA		1,522,000	1,614,194	1,704,640	1,807,897	1,546,428	1,640,102
Egypt	Jan.–June	315,000	320,000	352,800	358,400	320,056	325,136
Mauritius	June–Jan.	580,000	517,391	649,600	579,478	589,309	525,695
Réunion	Aug.–Jan.	200,000	165,000	224,000	184,800	203,210	167,647
Natal & Zululand	May–April	1,076,500	1,135,423	1,205,680	1,271,674	1,093,778	1,153,646
Mozambique	May–Dec.	160,000	150,767	179,200	168,859	162,568	153,187
Angola	May–Oct.	60,000	49,511	67,200	55,451	60,963	50,306
British East Africa*	Sep.–Aug.	140,000	130,000	156,800	145,600	142,247	132,087
Other Africa		275,000	270,000	308,000	302,400	279,413	274,334
TOTAL AFRICA		2,806,500	2,738,092	3,143,280	3,066,664	2,851,544	2,782,038
Total Cane Sugar Crops		**31,035,987**	**30,683,223**	**34,760,305**	**34,365,209**	**31,534,115**	**31,175,690**

†Dated: 28th January, 1960.

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SUGAR TABLET OR CUBE INSTALLATIONS

all over the world.

Cubes from dry granulated

The small machine with the big output!

Very low capital outlay

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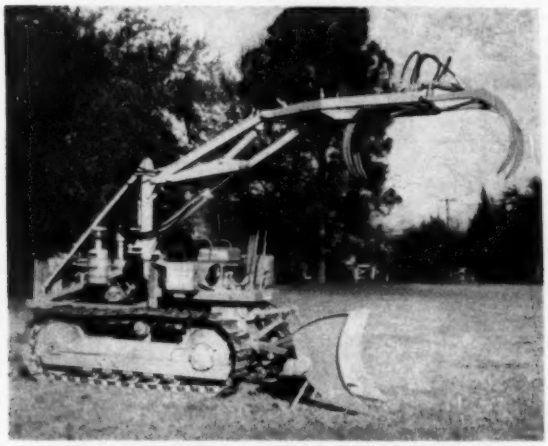
SUGAR CANE LOADERS



Broussard patented "Flex-Boom" Loader mounted on a "Caterpillar" D-4 crawler tractor, with push piler, for Puerto Rico.

Capacity 2000 lb/minute (Under Louisiana conditions), grab capacity (54 in. opening) 1500 lb., load clearance 12 ft., loading radius 10 ft. to 12 ft., boom swing, front to right, 100°.

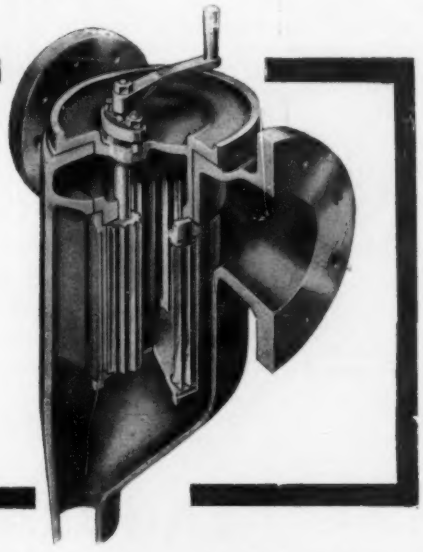
The Broussard heavy duty tropical type loader is now available for installation on the Track-Marshall, International TD-9, John Deere 440 crawler, Fordson-Major and various USA wheel tractors.

Extremely simple in design with few wearing parts and with perfect operator visibility on both wheel and crawler tractor installations, the Broussard Loader may be easily installed at the destination on tractors already in hand and quickly removed at the close of the harvest.

Manufactured by
BROUSSARD MACHINE COMPANY
ST. MARTINVILLE, LOUISIANA

Export Division
LOGAN PERKINS—SUGAR MACHINERY
International Trade Mart, New Orleans, U.S.A.

THE ROTOKLENE SELF-CLEANING STRAINER FOR ALL SUGAR LIQUORS



With the ROTOKLENE self-cleaning strainer liquors can be efficiently strained to fine limits. A simple, unique and reliable cleaning mechanism allows the strainer to be cleaned without interruption of flow by a few turns of a handle. Where constant cleaning is necessary, the strainer can be belt or motor driven. There are few moving parts, all robustly constructed to ensure long life.

Write for an explanatory booklet and details of installations where ROTOKLENE strainers are being used with outstanding success for straining clarified cane juice and similar applications in the Sugar Industry

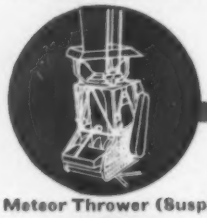
ASHWORTH & PARKER LTD

RIVERSIDE WORKS · BURY · LANCS

FOR ALL TYPES OF
MECHANICAL HANDLING EQUIPMENT

C & T LTD

Coal Screening Plant


Meteor Thrower (Suspended)

Unit Conveyor (Overhead)

Beaver (Bulk Stacker)

Bagging Unit

Walrus Stacker

A Crone & Taylor Bulk Cargo Loader & Thrower
Photograph by courtesy of Messrs. I.C.I. Ltd. Salt Division, Runcorn

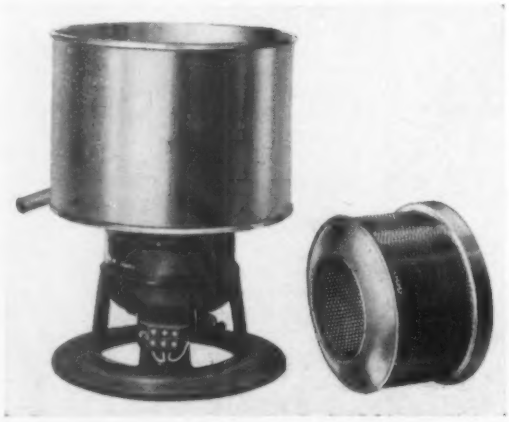
This equipment handles up to 300 Tons of Cargo per hour and is a most effective method for handling Bulk Cargo materials such as coal, coke, gravel, sand, salt, chemicals, etc.

For modern Cargo Handling Equipment get in touch with

CRONE & TAYLOR (Engineering) Ltd.
St. Helens, Lancashire, England
Tel.: St. Helens 3283

A Suma Product

LABORATORY CENTRIFUGE



This robust electrically-driven centrifuge operates at speeds variable from 1000 to 2000 revs. per min. The basket has $\frac{1}{8}$ in. perforations, and comes in two sizes : 6 in. diam. by 4 in. deep or 8 in. diam. by 6 in. deep. Both it and the casing are constructed entirely of Monel metal. The equipment is supplied complete with electric motor and regulator.

When ordering, please state A.C. **single-phase** voltage and frequency.

The Sugar Manufacturers' Supply Co. Ltd.
7 & 8, IDOL LANE, LONDON, E.C.3, ENGLAND.
Cables : "Sumasuco, London."

SUGAR CROPS OF THE WORLD

(*continued*)

(2) BEET SUGAR

	Harvesting Period	Long Tons 1959/60	Long Tons 1958/59	Short Tons 1959/60	Short Tons 1958/59	Metric Tons 1959/60	Metric Tons 1958/59
Europe—Germany	Sep.–Jan.	2,280,000	2,675,000	2,553,600	2,996,000	2,316,594	2,717,933
Czechoslovakia	Sep.–Jan.	840,000	850,000	940,800	952,000	853,482	863,642
Hungary	Sep.–Jan.	325,000	290,000	364,000	324,800	330,216	294,655
France	Sep.–Jan.	1,700,000	1,585,000	1,904,000	1,775,200	1,727,285	1,610,438
Belgium	Sep.–Jan.	400,000	445,000	448,000	498,400	406,420	452,142
Holland	Sep.–Jan.	550,000	570,000	616,000	638,400	558,828	579,149
Russia & Ukraine	Sep.–Jan.	5,600,000	5,800,000	6,272,000	6,496,000	5,689,880	5,893,090
Poland	Sep.–Jan.	1,130,000	1,200,000	1,265,600	1,344,000	1,148,137	1,219,260
Sweden	Sep.–Jan.	260,000	270,000	291,200	302,400	264,172	274,334
Denmark	Sep.–Jan.	270,000	395,000	302,400	442,400	274,334	401,340
Italy	Aug.–Oct.	1,125,000	1,090,000	1,260,000	1,220,800	1,143,056	1,107,495
Spain	July–Feb.	480,000	480,000	537,600	537,600	487,704	487,704
Switzerland	Sep.–Jan.	35,000	37,000	39,200	41,440	35,562	37,594
Bulgaria	Sep.–Jan.	135,000	125,000	151,200	140,000	137,167	127,006
Roumania	Sep.–Jan.	185,000	223,000	207,200	249,760	187,969	226,578
Great Britain*	Sep.–Jan.	660,000	723,000	739,200	809,760	670,592	734,604
Eire*	Sep.–Jan.	130,000	110,000	145,600	123,200	132,087	111,766
Jugoslavia	Sep.–Jan.	200,000	190,000	224,000	212,800	203,210	193,050
Turkey*	Sep.–Jan.	410,000	353,000	459,200	395,360	416,580	358,666
Other Countries	Sep.–Jan.	315,000	300,000	352,800	336,000	320,056	304,815
Total Europe		17,030,000	17,711,000	19,073,600	19,836,320	17,303,331	17,995,261
United States—Beet*	July–Jan.	2,100,000	1,849,043	2,352,000	2,070,928	2,133,705	1,878,720
Canada—Beet*	Oct.–Dec.	150,000	151,913	168,000	170,143	152,408	154,351
Total Beet Sugar Crops		**19,280,000**	**19,711,956**	**21,593,600**	**22,077,391**	**19,589,444**	**20,028,332**
Grand Total—Cane and Beet		**50,315,987**	**50,395,179**	**56,353,905**	**56,442,600**	**51,123,559**	**51,204,022**

*Refined.

BREVITIES

Sugar factories for Jugoslavia.[1]—An agreement has been reached with Italian companies for the supply of machinery for four new sugar factories of 1500–2000 tons capacity to be built at Sremska Mitrovica, Kovin, Senta and Péc. In addition, the factory at Zupanja is to be rebuilt.

* * *

Sugar Production in Colombia.[2]—According to the Colombian Ministry of Agriculture, the sugar production of the country in 1959 amounted to 250,000 metric tons as compared with 242,500 tons in the previous year. These figures do not include the production of brown sugar (panela).

* * *

Sugar in Afghanistan.[3]—The beet sugar factory at Baghlan processed 35,359·4 tons of beets, producing 4723·2 tons of white sugar in 1958/59. Jalalabad cane sugar factory which was put into operation at the end of 1958 after twenty years has been closed down again and is to be reconstructed for working of beet and cane. A new beet sugar factory is to be built at Herat.

* * *

West German Beet Crop.[4]—West Germany's beet crop in 1959 amounted to 8,169,265 tons according to final estimates issued by the Federal Bureau of Statistics. This compares with a crop of 11,236,624 tons in the previous year and is 11.9% below the average for 1953–58. Yield per hectare went down from 39·58 tons in 1958 to 28·45 in 1959, while the sugar content was between 17 and 18%.

Jordan Sugar Plans.[5]—According to an announcement from the Jordan Economic Ministry it is planned to erect a sugar factory, followed by a refinery and a further sugar factory. Sugar beet is to be grown in the Ghor region. At the moment Jordan imports 50,000 tons of sugar a year.

* * *

New National Sugar Institute building.[6]—The foundation stone of a new building for the National Sugar Institute was laid on the 22nd October 1959 by the Indian Food Minister. It was also planned to erect a modern fully-instrumented 500–800 ton sugar factory to run on commercial lines but to provide facilities for process and instrument control testing as well as for training of students.

* * *

Sugar beet in Siberia[7].—Sugar beet cultivation has now commenced in the Krasnoyarsk area of Central Siberia, according to a *Pravda* report quoted by Reuter. So far, some 5500 hectares have been devoted to the crop but it has been decided to extend this next year to 23,000 hectares. The beet is reported to be of good quality but, until the completion of a sugar factory in the area, it will be used as cattle fodder.

[1] *Zeitsch. Zuckerind.*, 1959, **84**, 638.
[2] F. O. Licht, *International Sugar Report*, 1960, **92** (Supp. 1), 8.
[3] F. O. Licht, *International Sugar Report*, 1960, **92**, (Supp. 1), 11.
[4] *Public Ledger*, 9th January 1960.
[5] *Zeitsch. Zuckerind.*, 1959, **84**, 639.
[6] *Indian Sugar*, 1959, **9**, 376.
[7] C. Czarnikow Ltd., *Sugar Review*, 1959, (434), 201.

BREVITIES

New Sugar Factory for West Bengal.[1]—A new factory at Ahmadpur, West Bengal, has started operations. During its initial season it will operate at only about one-third of its full capacity. It is designed to produce between 11,000 and 12,000 short tons of sugar in a season. The only other mill in West Bengal produces about 11,000 short tons a year while West Bengal's total annual sugar consumption is estimated at about 155,000 short tons.

* * *

Caroni Ltd. 1958/59 Report.—Trinidad suffered in 1959 a more severe drought than has been recorded for over thirty years. It began in October, 1958, and continued until late July 1959. Growth of cane was seriously checked and yields per acre were lower than in 1957/58 by 10%. Moreover, some young cane was too immature to reap and has had to be held over until the next crop. The reduced yield resulted in an increase in costs of nearly £3 per ton of sugar and it is this which is chiefly responsible for considerably lower profits compared with the results which have been achieved in recent years. Sugar production was 75,686 tons in 1959 as against 78,257 tons in 1958. The investigation of a scheme for making paper from bagasse is still proceeding but has been complicated by a number of issues such as the availability of water and the disposal of effluent, and no final decision has yet been reached. In co-operation with Ste. Madeleine Sugar Company Ltd., an Agricultural Research Department has been set up under the direction of Dr. A. J. VLITOS.

Stock Exchange Quotations

CLOSING MIDDLE

London Stocks (*at 17th February*, 1960)

Anglo-Ceylon (5s)	20/3
Antigua Sugar Factory (£1)	17/6
Booker Bros. (10s)	32/9
British Sugar Corp. Ltd. (£1)	26/9
Caroni Ord. (2s)	4/6
Caroni 6% Cum. Pref. (£1)	19/9
Distillers Co. Ltd. (6s. 8d. units)	35/3
Gledhow Chaka's Kraal (£1)	62/–
Hulett & Sons (£1)	76/3
Jamaica Sugar Estates Ltd. (5s units)	9/6
Leach's Argentine (10s units)	17/3
Reynolds Bros. (£1)	59/6
St. Kitts (London) Ltd. (£1)	*22/–
Ste. Madeleine (Ord.) (£1)	29/6
Sena Sugar Estates Ltd. (10s)	22/–
Tate & Lyle Ltd. (£1)	59/9
Tate & Lyle Investments Ltd. (5s)	15/3
Trinidad Sugar (5s stock units)	32/3
United Molasses (10s stock units)	44/3
West Indies Sugar Co. Ltd. (£1)	20/–

*200% Capitalization

CLOSING MIDDLE

New York Stocks (*at 16th February*, 1960)	$
American Crystal ($10)	38¼
Amer. Sugar Ref. Co. ($100)	29⅞
Central Aguirre ($5)	23¼
Cuban American ($10)	15¼
Great Western Sugar Co.	30½
South P.R. Sugar Co.	17⅛
United Fruit Co.	26¼
West Indies Sugar Corp. ($1)	31

Third Greek sugar factory[2].—It is rumoured that a third sugar factory, to be erected in the Thessaloniki area of Greece, is to be built by an Italian firm.

* * *

Chinese sugar production[3].—The sugar crop of the 1959 campaign was about 1·2 million tons or about 30% more than in 1958 when 900,000 tons was produced (847,000 tons in 1957, 810,000 in 1956, and 410,000 tons in 1955). It is planned that, in 1962, the crop will be about 2·5 million tons. Since 1949, 20 large and 81 smaller sugar factories have been built.

* * *

New Factory for Iran.[4]—The Iranian company Sherkat Sahami Ghand Esfahan has placed an order for a new sugar factory and refinery with Soc. Fives Lille-Cail of France. The factory, which will be situated near Esfahan, is to be completed by October 1960 and will have a daily processing capacity of 1000 tons of beet which may be later increased to 1500 tons. The refinery will have a processing capacity of 150 tons of raw sugar a day.

* * *

New contract for the New York Exchange.[5]—After passing two readings by the Board of Managers of the New York Coffee & Sugar Exchange, Inc., a new contract, "No. 7", providing for the delivery of raw sugar in bulk was submitted for a vote and approved by the membership on January 6th. Trading in the new contract started on 11th January for deliveries in March 1960 and thereafter[6].

* * *

Beet Sugar Plans for Argentina.[7]—In December technical experts of the Polish organisation CEKOP visited San Rafael in the Province of Mendoza to study the possibility of installing a beet sugar factory in that town. Experimental cultivation of beet in the Province has proved satisfactory and has yielded a high sugar content. CEKOP was recently awarded a tender for the construction of a beet factory in Santa Fé and is also constructing a cane sugar factory in Entre Rios[8].

* * *

Metric Weights in India.[9]—From November 1st 1959 the sugar industry was to change over to the metric system of weights for buying and selling. The prices of cane are already fixed both in terms of maunds and quintals (100 kg). According to a Government notification the sugar factories have been given the option to continue the existing system of weights for a period of two years from 1st November.

* * *

Sugar International.—American Factors Associates, Limited, Hawaiian Dredging & Construction Co., Ltd., and J. H. Pomeroy & Co., Inc., of San Francisco, have formed an association to be known as Sugar International, to design, construct and operate all or any part of a sugar industry in any country throughout the world's 'sugar belt'. Operations of Sugar International will include all manner of related projects such as building roads, reservoirs, storage and loading facilities, docks, piers, refineries and various by-product installations.

* * *

Overhead irrigation in Uganda[10].—Early in December the Governor of Uganda inaugurated the first phase of an irrigation scheme covering 1500 acres of the Muljibhai Madhvani sugar estate near Jinja. The cost of this first phase was £125,000 and it is hoped that, in the areas involved, sugar yields will be increased by about 30%. Plans to supply a further 1500 acres with irrigation are in hand.

[1] *Public Ledger*, 9th January 1960.
[2] F. O. LICHT, *International Sugar Report*, 1960, **92**, (Supp. 2), 23.
[3] *Zeitsch. Zuckerind.*, 1960, **85**, 37.
[4] F. O. LICHT, *International Sugar Report*, 1960, **92**, (Supp. 1), 11.
[5] *Lamborn*, 1959, **37**, 233.
[6] C. Czarnikow Ltd., *Sugar Review*, 1960 (438), 11.
[7] *Fortnightly Review* (Bank of London & South America), 2nd January 1960, p. 7.
[8] Cf. *I.S.J.*, 1960, **62**, 27.
[9] *Indian Sugar*, 1959, **9**, 381.
[10] *Commonwealth Producer*, 1960, (375), 3-4.

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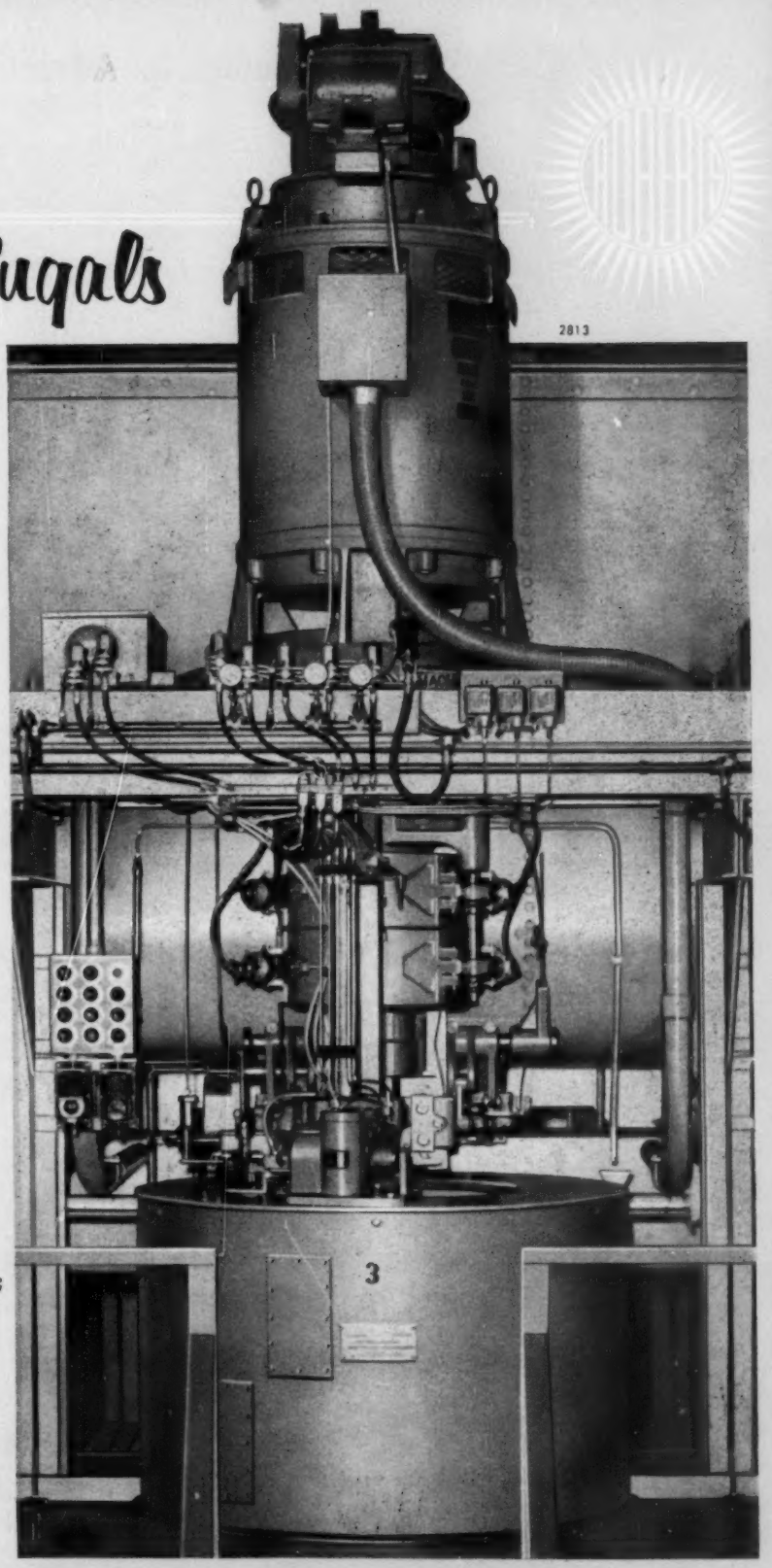

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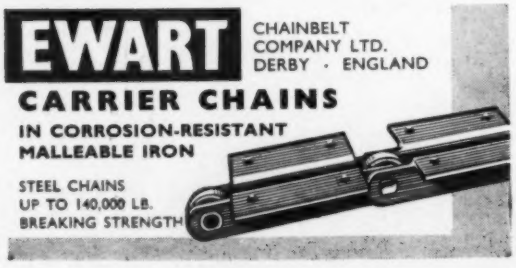

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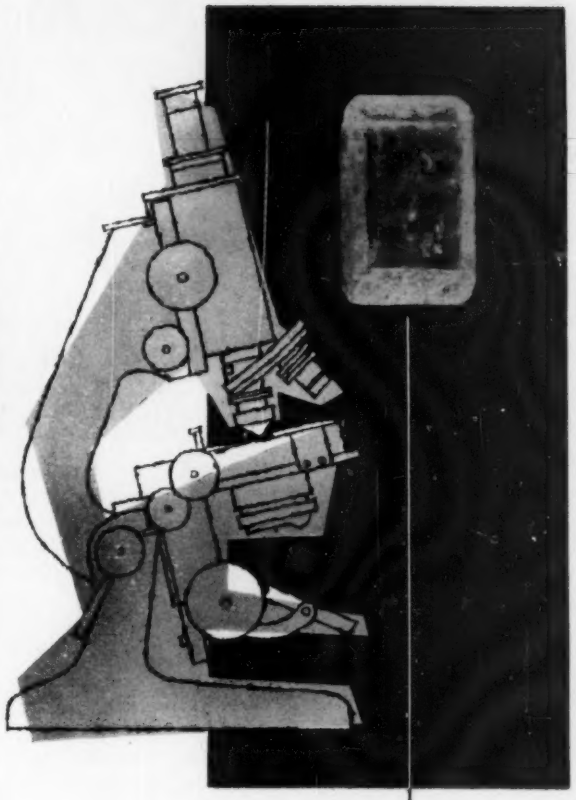

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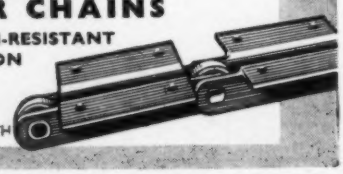

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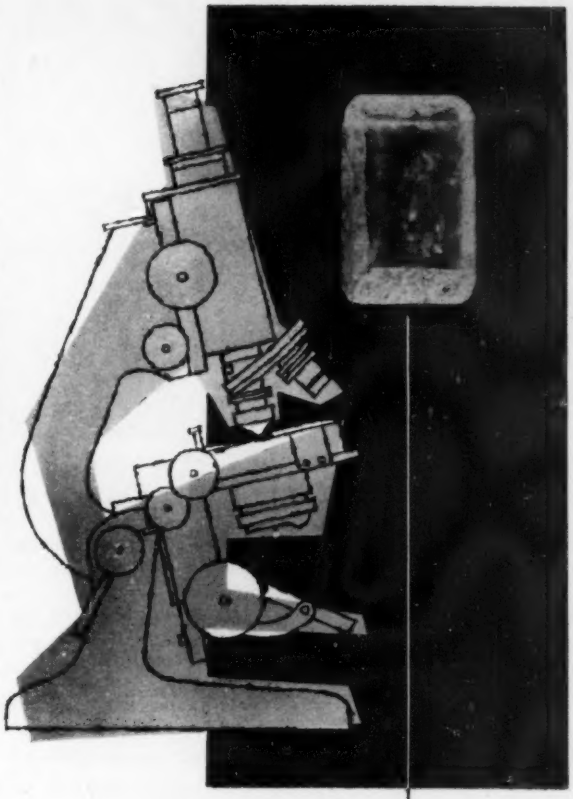

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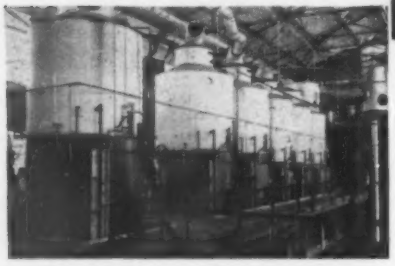

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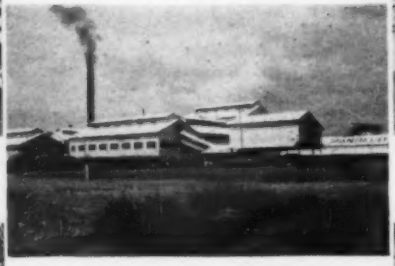

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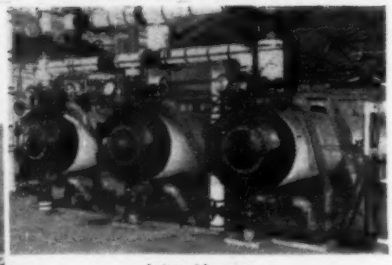

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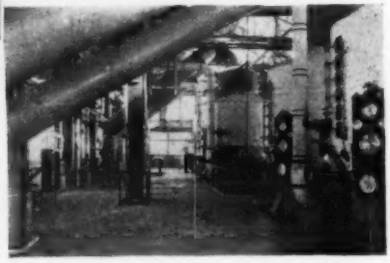

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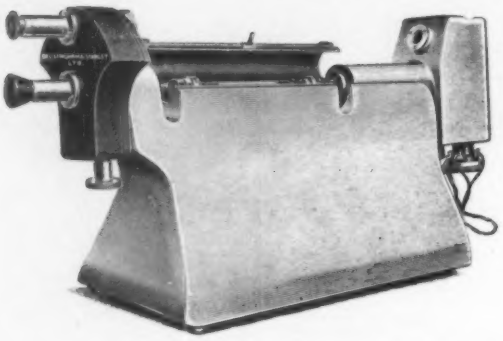

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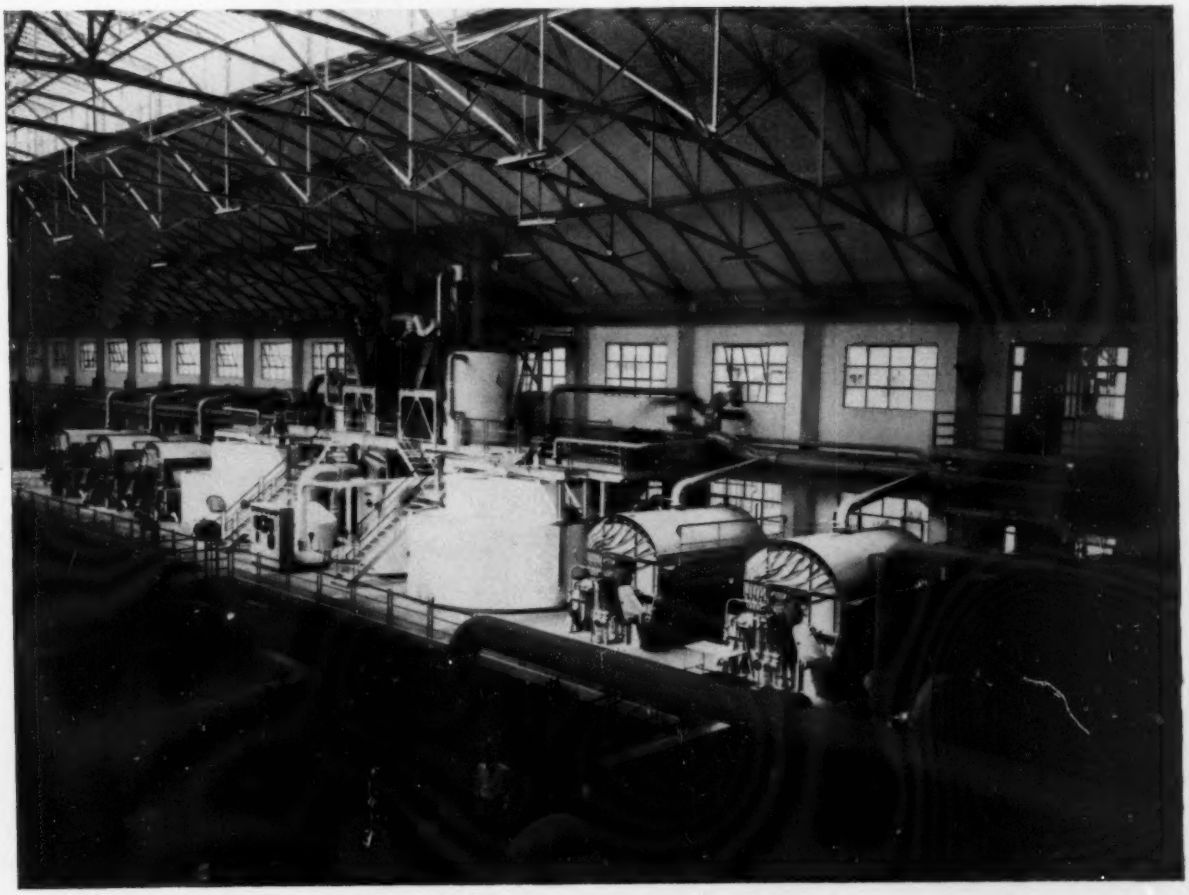

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